HARRY BAERG

CREATION AND CATASTROPHE

Grinnell

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Creation and Catastrophe

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The Story of Our Father's World

Written and Illustrated by

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Contents

The mass of elements hung swirling in space, awaiting the Creator's commands.

1

The First Dominion

OUT OF THE invisible our Father made His world. The mass of elements in the form of gas, vapor, and solids hung swirling in space. God made the substance of the world and was not indebted to any pre-existing material,[1] for all things were made by Him, and without His power nothing was made.[2]

On the first day of Creation He spoke light, the visible form of energy, into existence. Just what kind of light it was we are not told. It may have come from a heavenly body like the sun, or from the sun itself. Possibly the light came directly from the Creator.

The Holy City has no need of the sun. The Lord Himself is the source of its light.[3] Wherever it came from, it must have been from the same direction as the sun later shone, for the day-night cycle now began. The evening and the morning marked the first day, and there is no reason to believe that the length of that day was different from those that followed.[4] Most plants die when subjected to a night of abnormal length.

By a spoken word God separated the heavier materials of the earth such as water, soil, and rocks from the lighter materials, such as water vapor, oxygen, nitrogen, and carbon dioxide, that make up most of the atmosphere. The law of gravity could have been one force used in making this separation. It is still effective in holding together the mass of the earth, keeping it from flying apart as a result of the centrifugal force such a body generates in its rotation about the sun.

Then the granite foundations of the earth were lifted up and the pre-Flood continents rose from the mass of muddy water in what must have been a giant upheaval. Water flowed off in streams and rivers. Lakes and seas formed from this flow in the low places of the earth's surface. Here the silt in

No information has been given concerning the light that God made, except that it was good. We do not know from where it shone.

the water settled and gradually cleared, in preparation for the life soon to appear in it.

Next, green grass grew on the new soil and full-grown trees stood tall in forest groves. Fruit ready to eat hung from their branches and from the vines that trailed among them. A living carpet of grass, flowers, and shrubbery appeared at the word of the Creator, covering the rolling hills and level plains that had so recently risen out of the water. How beautiful it must have been! No wonder the Creator said that it was good.

On the fourth day God ordained the sun and moon "for signs, and for seasons, and for days, and years." Some think that the light of the first day may have been from the sun, but that it cast a diffused light upon the earth and was not itself visible, because of the mass of vapors in the atmosphere. If so, then on the fourth day the sun and moon became visible as heavenly bodies.

The Record says, "He made the stars also."[5] The Bible does not say that God made the stars on the fourth day, but rather that they were also the work of the Creator. Perhaps like the sun and moon, they became visible on the fourth day for the first time.

A study of the starry heavens shows us that the earth is only a small speck in our solar system, revolving around the sun. Of the nine major planets in our system, earth is one of the smaller. Its orbit around the sun also is small compared to that of Jupiter, Saturn, Uranus, Neptune, or Pluto. But it appears to be the only one in our solar system that is inhabited. To us who are on it the earth seems to be a vast sphere. To the Lord, the Creator, it is of special importance as the home of man. But when we think of it in relation to all God's other creation, it seems insignificant.

God separated the lighter materials of the earth from the heavier to make the atmosphere, the water, and the solid ground.

The Milky Way Galaxy, of which our solar system is a part, likely contains many such systems, each revolving about a sun that to us appears as a star. This Milky Way Galaxy, in turn, is only one of the many island universes that, in uncounted numbers, revolve in orderly precision about the throne of God.

Among the planets in the other celestial systems of the millions of island universes many must be situated like our earth—at the right distance from their suns to support life comfortably, being neither too hot nor too cold. These unfallen worlds were created long before ours. Their habitants watch the unfolding drama of man on our earth with interest,

and see in it an object lesson on the results of the entrance of sin.[6] They also see the love and justice of the Creator, who has existed from eternity and has made all things.

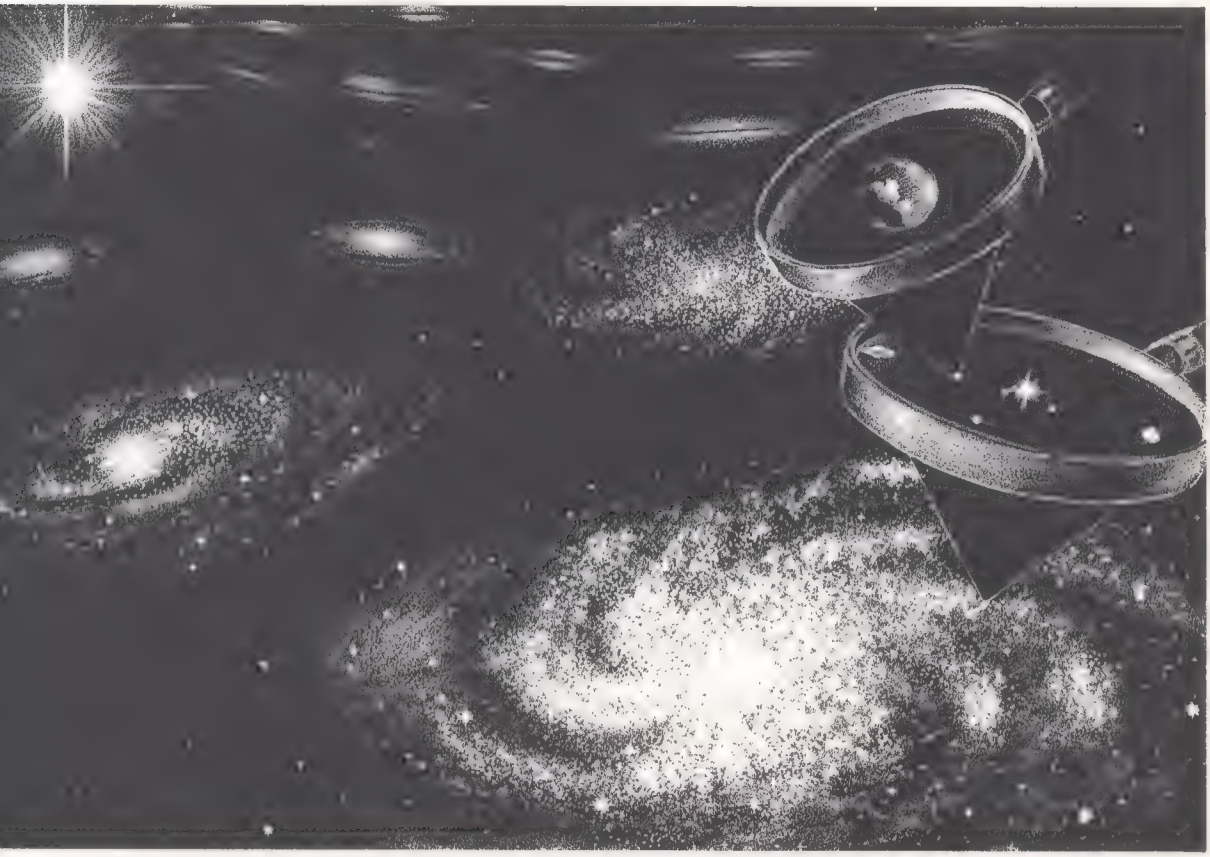
On the fifth day animal life appeared. Many creatures, from the one-celled amoeba to the shellfish, crayfish, minnows, and larger fish, began to swarm in the waters. The Bible mentions "great whales," but this is more correctly translated "sea monsters" and may refer to some of the large fish or even marine reptiles that abounded in pre-Flood times.

We know that God created water creatures of all kinds. They were to occupy the surface, the shallow water, the deep places, the muddy bottom, as well as the sand and gravel of the streams, lakes, and seas.

Next, birds appeared on the water, along the shores, and in the woods and fields. After that, God made the animals we call mammals. They now range in size from the tiny shrew to the elephant and the whale. The Scriptures mention creeping things, such as worms, perhaps also the frogs, snakes, turtles, spiders, and insects. Would the world have

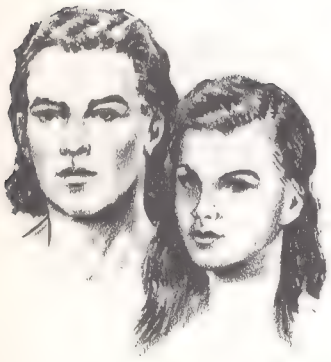
Animal life appeared first in the waters, in great abundance and variety.

Our Father's world, this earth, is only a small speck in His vast universe.



been complete without these more lowly creatures?

Last in the process of Creation came man, also a mammal, but made in the image of God. Created from the elements of the earth, he was to have authority over the beasts of the field, and was the crowning work of Creation. Eve, Adam's companion, made from his rib, was to be his equal. Only one pair of human beings was created, and they were told to multiply and replenish the earth.



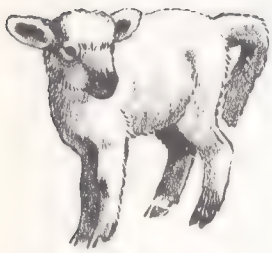
Only one pair of humans, Adam and Eve, was created to populate the entire earth.

Though Adam and Eve appeared mature and fully grown they had capacity for continuous development.[7] They were created in the image of God, but His character was not yet fully formed in them or they would not have sinned. It was the Creator's purpose that man should develop daily as he lived. The longer he lived the more fully would he reveal the character of his Maker. He was capable of development, and his capacity and vigor were to increase as life continued throughout eternity.

Adam was tall and ruddy of complexion; much taller than men today. Eve was a little shorter and of more delicate build. Both were naked and unashamed, clothed in a covering of light.[8]

In the world of animals God may have created only one pair of each kind. They were to be the ancestors of all their kind that came after them. In this way the Garden of Eden, in which they were placed, may have been the center of all life, from which it was to spread and cover the whole earth.

Precisely what the original animals in the Garden of Eden were like we cannot know. How sheep, for instance, would compare with sheep of today, and which of the various wild or domestic breeds they would most resemble, we cannot imagine.



It is likely that sheep were among the original created kinds, since Abel later offered a lamb on his altar.

Some animals are mentioned in Isaiah 65 as being in the new earth. They are the wolf, lion, serpent, lamb, and "flocks" and "herds." Since the new earth is to be a re-creation of the old and a restoration of the time of Eden, we might think that these animals would have been found there. It is unlikely, however, that they would be representatives or types of animal groups. It is more reasonable to suppose that the prophet used animals that were familiar to the people of his time. He used these as symbols of types that are now enemies, but that will in the new earth live together in peace and harmony.

This brings up another interesting point about the animals in Eden. All must have been vegetarians, as God designed that no life should be taken.[9] Thus there were no beasts of prey

or parasites or venomous reptiles or stinging insects. These came later with the entrance of sin.

The plants of the Garden of Eden are described only in the most general terms. Fossil remains indicate that many unusual plants existed before the Flood. Since the life of a tree is so much longer than the life of an animal, we could expect to find less change in the trees than in the animals, from the original Creation to the Flood.

Giant club mosses, seed ferns, tree ferns, cycads, and others were common in the low, wet jungles of the pre-Flood world and probably had their start in Eden. In the uplands there were species more like those we have today. There were some broadleafs, conifers, palms, and ginkgoes.

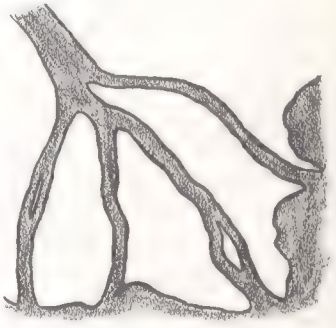
The sequoias were also among the giants of that day, and in the favorable climate of that time they grew to great size.

Plants, like man, may also have been created only in the Garden of Eden and from there spread out over the world. Vegetation would spread even more rapidly than animal life, because the wind would carry seeds far and wide. In this way plants might be established in new areas before the animals arrived. God created the earth as a going concern and sustained it by His power and by the laws He ordained, but He shared His creative power with all forms of life through procreation.

Among the trees of that time were giant club mosses, seed ferns, and cycads.

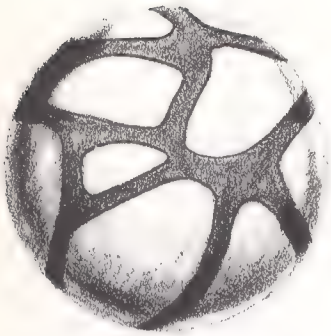
The location of the Garden of Eden has long been of interest to men. Some have thought that it must have been in the valley of the Euphrates, since that is the name of one of the rivers that flowed through the garden and watered it. But this could hardly have been the same river we know today. The changes that took place on the surface of the earth during the Flood were so great that probably most of the geographic features were obliterated. It is probable that Noah or one of his descendants named the present Euphrates River after the one that flowed in Eden. This could also account for the names Havilah, Hiddekel, Ethiopia, and Assyria as used in Genesis.

The fact that the river parted into four heads as it entered the Garden to water it would suggest that it might be in a delta area, for this is the situation where we find rivers parting today. Usually they come together as tributaries forming a mightier river that empties into the ocean.



The river that flowed through Eden then parted into four heads as rivers do today in delta areas.

The seas of the Edenic world were probably not vast and deep as they are today, but comparatively shallow and more like large canals. The abundant marine fossils are of kinds



At that time the seas of the earth were probably like large connected canals.

that grow in shallow water. From these fossil shells, corals, and heavy lime deposits we can have an idea where these pre-Flood seas may have been. They have been roughly mapped, but of course with our limited knowledge we cannot be at all sure of their limits.

An interesting theory suggests that these canal-oceans were a means by which the climate of the earth was moderated at that time. The rotation of the earth, together with the tidal effect of the sun and the moon, might have caused a general east-to-west flow of the water in the canals. However, because of the diagonal direction of some of them the water would also flow from the equator to the poles and back again. This would tend to make the polar regions warmer and the tropics cooler. That in turn would help to account for the warm-climate fossils that have been found in both the arctic and antarctic regions.[10]

It is believed by some that a band of mist covered the

tropics before the Flood, shielding them from the direct rays of the sun and thus helping to moderate the temperature. Perhaps this might be the "swaddling band" referred to in Job 38:9. The condensation of this moisture is, according to this theory, supposed to have resulted in the heavy rain during the Flood. This, like the preceding, is an interesting theory, but is of course highly speculative.

The trees in the Garden of Eden grew in groves with grassy meadows between. Lakes dotted the countryside, but probably there were no large swamps, polar barrens, or sandy deserts when the world was new.[11] It must have been beautiful indeed, for we are told that the "morning stars sang together, and all the sons of God shouted for joy" at the triumph of the Creator.[12]

The Garden remained on the earth until shortly before the Flood. Adam and Eve and their descendants came to worship at the gate of the Garden. They were prevented from entering, of course, by an angel with a flaming sword. God would not allow sinful man to eat of the tree of life and become an immortal sinner. The Garden with the tree of life was taken to heaven before the Flood.[13]

In Job 38:9 God refers to the clouds as a garment for the earth.

[1] Ellen G. White. *The Ministry of Healing.* Pp. 414, 415.
[2] John 1:3.
[3] Rev. 22:5.
[4] White. *Testimonies to Ministers.* Pp. 135, 136.
[5] Gen. 1:16.
[6] White. *The Great Controversy.* Pp. 677, 678.
[7] ———. *Education.* P. 8.
[8] ———. *Patriarchs and Prophets.* P. 45.
[9] ———. *Spiritual Gifts.* Vol. 4, part 1, p. 120.
[10] Harold W. Clark. 1946. *The New Diluvialism.* Pp. 59, 60.
[11] White. *Patriarchs and Prophets.* P. 44.
[12] Job 38:7.
[13] White. *Patriarchs and Prophets.* P. 62.

For Further Reading

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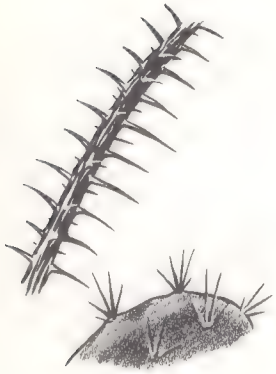


2

Thorns and Thistles

Who made the thorns and thistles that are so common today?

WHEN ADAM AND EVE were driven from the Garden of Eden because of disobedience, a curse was pronounced upon the earth for their sake. It would become less fruitful, and thorns, thistles, briars, and weeds would plague them while they were cultivating the soil. The curse did not come all at once.[1] It began at Adam's fall, increased at the murder of Abel, and greatly multiplied at the time of the Flood. At first, its effect was more deeply felt on man and animals, but soon it was evident everywhere.

At Creation, all animals must have lived on vegetation. Can you imagine your cat living on grain? You may have seen a cat or dog eat grass at some time. They find it difficult because their teeth are not made for eating grass, nor is their digestive system able to absorb it. All that grass does inside a cat is to scrub it out—and that is the reason why a cat eats such unaccustomed fare. Yet in the beginning all animals were able to live on vegetable matter. When and how did the change come?

In the stagnating waters of the marshes some reptiles found an ideal environment and grew to enormous size.

God did not make thorns or thistles, [2] yet they are abundant now. Who made them? Who made the sharp claws, the pointed teeth, the recurved beaks of today's flesh-eating animals and birds? The answer is that they have developed as a result of sin. Satan has corrupted God's original creation.

As the geographic aspects of the earth changed, plant and animal life also changed to meet the conditions of the new habitat. This is what we refer to as adaptation to environment. There was some adaptation before the Flood. There has been far more since, as the deserts, polar regions, and high rocky mountains appeared. These habitats were unknown in the world before the Flood.

After the Fall the physical features of the earth may have

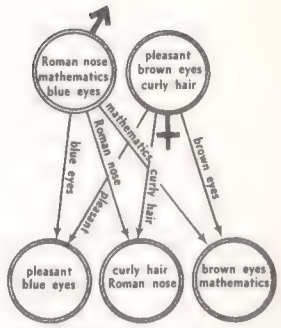
gradually changed. The world was still watered by a mist. Trees grew tall and straight, vegetation was abundant, and bitter cold and extreme heat were unknown. The climate of the tropics must have been warm, though not excessively so. Slowly, the ideal conditions began to move out of adjustment. Small ponds and lakes, the home of waterfowl, fish, and frogs, grew into large morasses choked with rank swamp growth. Fossils indicate that by the time of the Flood vast bogs had apparently developed.

In these stagnating waters certain of the reptiles, descended from those God had made, found ideal homes. As they lived in the shallow water and fed on the lush plants they grew to enormous size. Later some, such as the *Brachiosaurus,* became so large and heavy that they needed to rely somewhat on the water to support their massive weight. Restorations of these creatures built up from fossilized skeletons give us an idea of what these monsters looked like. No wonder God chose not to preserve them.

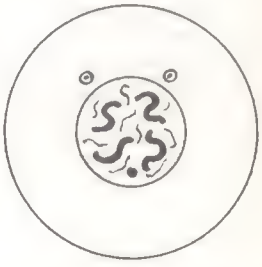
Two seemingly opposite laws control the characteristics children inherit from their parents. One of these laws says that like begets like, the other that like begets unlike. We harmonize the two by explaining that peas produce peas, rabbits produce rabbits, and people produce people. But even the peas in a pod are not all alike, nor are the rabbits in a litter or the children in one family. There are always visible differences, and also intellectual and character differences that may not be visible but that are no less real.

Children in the same family differ because they inherit characteristics from parents who are different from each other. One child may have his father's Roman nose, his mother's curly hair, his father's flair for mathematics, and his mother's pleasant disposition. Another child may have a different combination of characteristics inherited from the same parents, and he may even inherit some characteristics from a grandparent or great-grandparent that didn't show up in his parents.

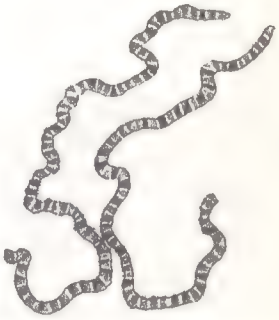
Those with no background in the study of genetics may find an explanation helpful. Within each plant or animal cell is a nucleus. In the sperm and egg nuclei there are worm-shaped bodies called chromosomes. These chromosomes come in pairs. Half of each pair represents the characteristics of the father and the other half those of the mother. Man has 46 pairs of chromosomes, while the fruit fly has four. In a newly formed sex cell only half the chromosomes are present.



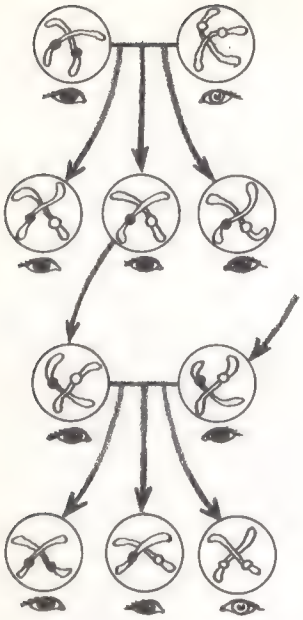
The children in a family inherit various combinations of characteristics transmitted by their parents.



The chromosomes in the reproductive cells come in pairs, one of which represents the father and one the mother.



Each band, or gene, on the chromosome carries a different characteristic of the individual.

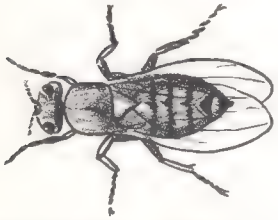


A brown-eyed husband and a blue-eyed wife may have all brown-eyed children, but there may still be blue-eyed grandchildren.

When the male sperm unites with the female egg the two half sets combine to again form the full complement of chromosomes in the cell.

On these chromosomes there are bands or areas called genes, which carry the characteristics of that individual, in specified locations. Genes determining eye color have their particular location, as do those for curly hair and for all of the other characteristics that make one person different from another. When a brown-eyed man marries a blue-eyed woman their children will have both brown-eyed and blue-eyed characters in their paired genes. These could in turn produce children with both kinds of eye color. Various distinctive qualities can be combined in a large number of different ways and so produce an infinite variety.

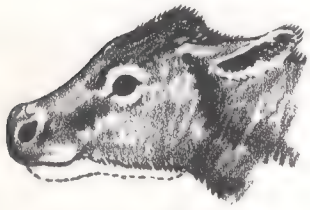
The process is really much more complicated than indicated here, and is a fascinating study for anyone who wishes to read further about it. It is introduced here to show that there are in the normal course of crossings of individuals possibilities for many kinds of offspring to arise.



The fruit fly, because it has short generations and only four chromosomes, has been useful in the study of genetics.

But that is only the beginning. H. J. Muller experimented with fruit flies. He found that by bombarding their chromosomes at specific places with X-rays, he could produce changes in the genes that would show up in the next generation as characteristics that had not appeared in the parents. Such changes occur all the time and are called mutations. This was the first time that anyone had been able to induce them artificially, and Muller was awarded a Nobel prize for his work.

Mutations are changes in genes that can be transmitted to the offspring and become part of the genetic heritage. They are usually minute, unimportant, and unnoticed. They can be beneficial, neutral, harmful, even fatal. Calves born without lower jaws or legs do not live long. Naturally such mutations are not transmitted. Those that are helpful to a plant or animal in the keen competition for existence among its fellows, or in its survival against enemies, are more likely to live. These may soon become common characteristics. Ordinarily mutations average out and are lost in continued backcrossings unless they are an advantage or the individuals are isolated.



Lethal mutations, such as the absence of a lower jaw in a calf, naturally do not reproduce, because the animal cannot live.

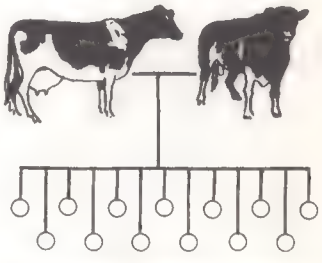
Prof. Richard Goldschmidt once conducted an experiment with gypsy moths to prove that those of one color would gradually change in several generations to quite a different color. He started out with medium-gray moths. Among the offspring of several generations there were some that were

Prof. Richard Goldschmidt hoped to show in his experiment with gypsy moths that succeeding generations would be quite different from those with which he began.

almost white and others that were almost black. However, the end result of his experiment, after these had all crossed freely, was that the moths he finished with were just about the same color as those with which he started. He had to confess that as an attempt to demonstrate evolution his experiment was a failure.[3]

Had Goldschmidt separated the darker moths and selected only their offspring he could soon have had a pure black strain. Or had he done that with the light ones he could have developed a white strain. This is what stock breeders have done successfully for generations. We call this artificial selection.

Can such selection happen naturally in nature? Suppose the experimenter had released his varicolored moths in a location halfway between a bright beach area with acres of sand dunes, and a dense rain forest. Some moths would have gone to one place and some to another. The darker moths in the sand dunes would soon have been gobbled up by the various birds of prey. The only ones to escape would be the light-colored moths that were able to hide in the light sand and shrubbery. Succeeding generations would get lighter and lighter. In the same way the darker moths would have the ad-



The stock breeder inbreeds his cattle in order to strengthen desirable traits.

Grasshoppers are usually the color of the ground on which they are sitting.

vantage in a forest and would in time produce a continuing dark strain.

There are many examples in the world about us that this very thing has happened. Darwin was justified in maintaining that natural selection is a common phenomenon. But he applied it as a universal principle whereas the facts indicate that it operates only to produce the same species. Have you ever noticed that grasshoppers are usually the color of the ground on which they rest? Moths often match the color of the bark to which they attach themselves. You may have noticed that pocket gophers in a black soil area are dark gray. Those in light soil are light tan and those in red soil are reddish in color.

It is of interest that among many organisms the number of offspring is so great that if they all lived they would soon fill the earth. Fortunately for us, they do not. If the successive offspring of one pair of field mice all lived, at the end of the normal year-and-a half life span of the original pair they could number well over a million.

Normally, few of the offspring of each set of parent mice live to become parents of the next generation. With competition so keen it is likely that, in general, the ones best fitted would survive, and if a particular mutation gave them a distinct advantage it could quickly become a common characteristic of all the surviving mice. Of course, "the race is not [always] to the swift, nor the battle to the strong," and chance does vary this general trend.

How did the development of claws, antlers, and recurved beaks come about?

Now back to our original question about the thorns, thistles, teeth, claws, and recurved beaks of carnivorous creatures. The development of this equipment must have come about through mutation, probably by degrees. At first they may have been simply defensive weapons. Then they could have become the means of survival, enabling these animals to live by eating their victims. This must have happened before the Flood, for among what we assume to be the fossil remains of pre-Flood origin we find carnivorous mammals, reptiles, and birds.

Remember that mutations are changes that can be inherited and passed on to succeeding generations. There is a saying among geneticists that you can't inherit a wooden leg, but you can inherit a wooden head. Dog breeders have cut off dogs' tails for generations, but puppies still have tails. If a puppy is born without a tail, it is possible that some of its descendants will be without tails. In this case it was a change in a

gene or an inheritance from an ancestor, but not the result of the docking of the parents' tails.

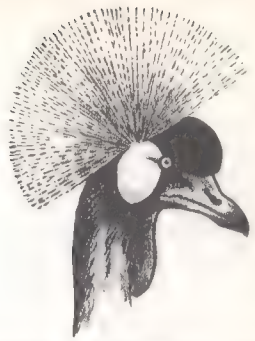
When a biologist speaks of the "survival of the fittest" he refers only to the characteristics that enable a species to survive among its competitors, whether they be desirable in our opinion or not. It is not only the fittest that survive in natural selection. The strongest male keeps all the females for himself, thereby ensuring the survival of the characteristics that made him the strongest. This is especially true among polygamous animals. It also happens that the most attractive male often wins the largest number of females.

Among birds, this often encourages the development of elaborately colored feathers that are displayed to the full at mating time. Reptiles of the past and present are often adorned with outlandish manes, frills, and even sails. Some birds such as cranes have elaborate crowns. Some have attractive wings and tails, as in the birds of paradise, sun bitterns, and peacocks. These are all used in courting displays.

In the past defensive armament became extensive. Among the dinosaurs the *Triceratops* had three horns and a shield over its shoulders. The *Stegosaurus* had large bony plates all along its back and a spiked tail besides. Another reptile, the *Styracosaurus,* not only had a horn on its nose like the rhinoceros, but also a shield over its shoulders that terminated in six horns. Perhaps it was some such beast that John saw in vision.

The giant armadillo had a shell covering like its smaller relatives, and a spiked tail for additional defense. For offensive weapons the *Tyrannosauros,* a giant predatory dinosaur, had enormous jaws set with many sharp, six-inch teeth. It was 18 feet tall and 50 feet long and easily dominated the antediluvian scene, though it was neither as fast nor as fierce as it is sometimes described.

Another feature that may have been brought about by mutations was gigantism. At first it would seem that the largest creatures had the advantage over the others, and that as a result successive generations increased in size. In pre-Flood times there were dragonflies with wingspreads of 30 inches. Some butterflies had wings two feet across. A flying reptile, the *Pteranodon,* was about the size of a small airplane. Its leathery wings stretched out to 27 feet. Among the reptiles there were also the 87-foot *Diplodocus,* the 80-foot *Brachiosaurus,* and the 67-foot-long *Brontosaurus.* Much of the length of these creatures was in the neck and tail, but they were still



Among polygamous birds and mammals the handsomest and strongest male often wins the largest number of females and transmits his characteristics to many descendants.

Defensive armament, as in the Styracosaurus, became extensive in some of the pre-Flood reptiles.

Large size was apparently quite an advantage in survival at first.

formidable beasts—we can be glad they are extinct!

After the Flood there was a vulture with a 12-foot wing spread. The ostrich-like elephant bird stood 12 feet tall and could easily have picked up one of the small horses of that time and eaten it. The moa, which became extinct in New Zealand about the time of that island's discovery, was nine feet tall and weighed 500 pounds. A still earlier species was 12 feet tall, but not as heavy as the elephant bird.

Among the mammals there was a sheep seven feet tall with an eight-foot sweep of horns, and an ox whose horns spanned seven feet three inches. The Irish elk had a spread of antlers 11 feet from tip to tip. The *Paraceratherium*, an animal somewhat like the rhinoceros, was 18 feet tall and 25 feet long.

In recent years exceptional size has become a disadvantage, as in the case of the whooping crane.

In time gigantic size came to be a disadvantage. In more recent years many of our largest birds, such as the dodo, the great auk, and the moa, have become extinct. Others, such as the whooping crane, the trumpeter swan, and the condor, which have grown exceptionally large by our standards, have had to be protected and pampered in order to keep them from dying out. So, in ancient times, as conditions changed many of the giant species were not able to survive.

Those that lived before the Flood perished during that event. Of those that grew to great size after the Flood there were many that could not survive changing conditions. When the climate became too cold or too dry they were unable to live in the manner to which they had become accustomed, and so disappeared from the scene.

Grotesqueness also developed among many creatures. There seems to have been no good reason for some of the monstrosities that came into existence, except that perhaps Satan was trying to deface and degenerate what God had created. Some animals were extremely awkward in appearance and could have survived only because there were no carnivors around big enough to attack them with success.

There seems to be little practical reason for some of the monstrosities that came into being unless it was part of Satan's plan to pervert God's creation.

The pre-Flood *Pteranodon,* already mentioned as a flying reptile, had a large growth on the back of its head that helped balance an enormous beak, making its head look like that of a pickax. The 12-foot-long *Uintatherium* (after the Flood) had six pairs of blunt horns on its massive head, as well as two down-curving tusks. A giant rhinoceros had a pair of blunt horns on the end of its snout, looking very much like the branched arms of an overgrown slingshot. In addition to two conventional horns, one type of antelope had two more of similar length sprouting from its muzzle.

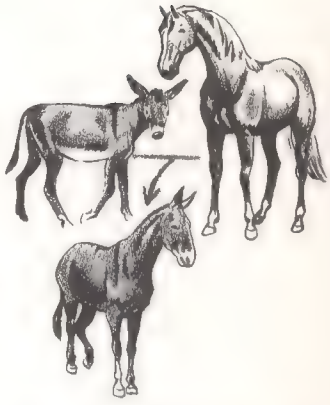
There was still another method, in addition to mutation, by which Satan evidently sought to confuse the species and to create innumerable varieties. This, we are told, was by means of amalgamation.[4] As here used, amalgamation refers to the uniting of two races to produce offspring. Such crosses often produce young of unusual size and vigor.

The poultryman crosses two breeds of chickens to produce hybrids that will be superior to either parent. The seed grower crosses two varieties of corn to produce a hybrid seed that will grow plants of exceptional quality and uniformity. The cattleman uses the same principle. Ordinarily it is not wise to build up a new breed from these hybrids, because they degenerate rapidly if they are at all fertile.

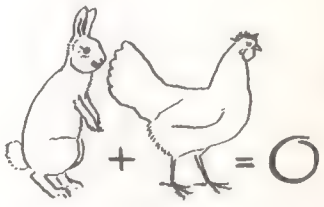
Crosses of two quite dissimilar kinds usually produce infertile offspring. Two that are similar and more closely related may have fertile young. A donkey can be crossed with a horse to get a mule. This type of hybrid is usually sterile. Crossing a bison bull with a beef cow usually produces sterile offspring also. However, during a 30-year period the fertile crosses of such unions produced a herd of "cattalo" that bred true. They were hardy like bison, but more gentle and manageable. Evidently they were not valuable enough to breed commercially, but the experiment shows that new breeds can arise from crosses that are usually infertile.

One reason hybrids are often infertile is found in the matching of genes in the chromosomes. Not only the number of chromosomes but the placement of the genes is important. Nevertheless it is remarkable how many fertile crosses can be made and how many of the offspring are fertile. It is possible that in the early centuries following Creation the structure of the chromosomes in general, as well as the number of chromosomes in animals, differed from what is now true. They may have been much less complex and admitting of more fertile crosses than they do now. With all the great disturbances following the Flood the genetic picture was probably more unstable and many more crosses may have become possible.

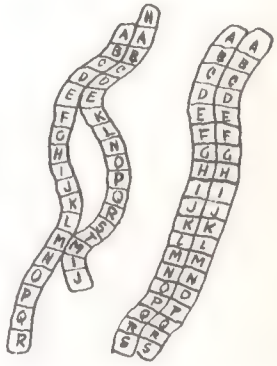
We have no evidence that rabbits crossed with chickens as some have maintained, or even that groups like cats and groundhogs ever crossed. One early biologist claimed that a giraffe resulted when the calf of a hyena-camel cross mated with a buffalo. All this is entirely fanciful. However, there has been much amalgamation or hybridization before and after the Flood, resulting in the many intergraded species



When crossing a donkey with a horse the result is a mule, which usually is sterile.



Naturally there is a limit to which animals can crossbreed.



To produce fertile offspring the chromosomes of the parents must be fairly similar.

that are found both in fossil form and as living specimens today.

With the present taboos on marriage between relatives it may at first seem strange that the children of Adam and Eve's children should have married each other. This is called incest today and is punishable by law in many countries. We avoid it because such inbreeding emphasizes the poor characteristics of those involved, as well as the good—a risk we can hardly afford. If practiced today we would have more idiots, more insane, more congenitally deformed, than we already have.

Adam and Eve were perfect. Without bad inheritance factors, their children could safely intermarry without danger of the next generation being born crippled, or in any way unfitted for life.

It is possible that inbreeding took place among animals and among men later, after life had degenerated and genetic changes had come. Some changes may have been further emphasized by inbreeding, thus producing some of the distorted monsters of the pre-Flood world.

Fortunately, in spite of Satan's manipulations, many beautiful and well-adapted creatures have developed on our earth.

Satan is a master of the genetic processes. He succeeded in filling the world with myriads of confused species that were grotesque, ferocious, gigantic, and dull-witted. Fortunately God intervened, and creatures of various kinds also developed that were beautiful and exceptionally well adapted to the part of the world in which they lived.

[1] Ellen G. White. *Spiritual Gifts.* Vol. 4, part 1, p. 122.
[2] ———. *Testimonies.* Vol. 6, p. 186.
[3] G. M. Price. In *Signs of the Times.* June 26, 1945.
[4] White. *Spiritual Gifts.* Vol. 3, p. 75.

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3
Giants in the Land

Jabal, one of Cain's descendants through Lamech, became a herdsman.

TO MAN HIMSELF came some of the changes that resulted from the entry of sin. Adam and Eve's first son, for whom they had great hope, was hardly grown when he killed his brother in a fit of jealousy and became the world's first murderer. Cain went to live east of Eden in the land of Nod. He married one of his sisters and reared generations of children as ungodly and rebellious as himself. Genesis refers to the girls as "the daughters of men."

After the death of Abel, when Adam was 130 years old, Seth was born to Eve. He was more like the righteous Abel, and his descendants are called "the sons of God." After his birth Adam and Eve had other children whose names are not recorded. Seth's genealogy is given, for it was through his lineage that the patriarchs and eventually Christ would come.

One of Cain's later descendants, Lamech, was also a murderer, for he killed a young man who offended him. He married two wives, who bore him sons possessed of some initiative and inventiveness.

Jubal, another of Lamech's sons, was a musician.

Jabal became a herdsman, domesticated cattle, and lived a nomadic life in tents. Jubal was a musician and played on instruments he contrived. Tubal-cain became a smith who worked in brass and iron, and taught his children the same craft.

Tubal-cain, still another son, was a smith and worked with metals.

Seth's descendants lived in the hills, away from the progeny of Cain, and worshiped God. Men of great intellect and long life, they could accumulate centuries of experience and learning by means of their retentive memories.[1] Their mental reach was far beyond that of scholars today. They had ability to comprehend and carry out vast projects, but seemingly were not as inventive as men now are. Because of their simple life and unusual powers, it was not as important to them to

Imagine robust, well-proportioned people 10 to 15 feet tall walking about among us!

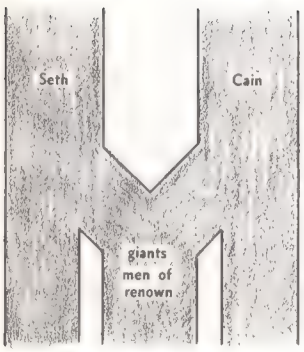
contrive tools and machinery such as we need, with our lesser physical powers and depleted resources.[2] They did not need our achievements in medical science, for they still enjoyed perfect health.[3]

Adam was more than twice as tall as the average man today.[4] He must have weighed nearly a ton, and was endowed with 20 times the vital force of modern men.[5] He lived to be 930 years old. Judging by the length of life of his descendants, six of whom are listed as having lived more than 900 years, man probably deteriorated very little physically before the Flood. With the overlapping of life spans and their excellent memories, the story of Creation could have been passed on from Adam until the time of the written records of Moses without serious loss.

Imagine well-proportioned, robust, healthy, handsome people 10 to 15 feet tall walking about among us! They would be quite out of place in our houses and cities! Even in their own time they must have appeared as lords of creation—which they certainly were. No wonder some of them became arrogant and self-sufficient.

In time, as their population increased, the generations of Seth spread out and came in contact with the descendants of Cain. To their surprise they found that "the children of men" were not all ugly murderers and that the young women were beautiful. As a result there was much intermarrying between the two races.

Considering all the inbreeding that had occurred up to this time, first with the marriage of brothers and sisters, then of cousins in the next generation, the races could have had distinctly different characteristics by the time they came together again. It may be that when they intermarried, the resulting children could have been considered hybrids, possessing unusual vigor.



The Bible says, "there were giants . . . in those days." Just how tall these men had to be to be called "giants" we can only conjecture, for they were among a people who were already giants by our standards. They are described as "mighty men . . . of renown." [6]

People living just before the Flood were still men of great intellect and high skill, though very sinful and under the curse of sin.[7] Their ability and their energies were chiefly spent in building homes and cities to gratify their pride and to impress those about them.[8] Of man of that time we read, "Every imagination of the thoughts of his heart was only evil

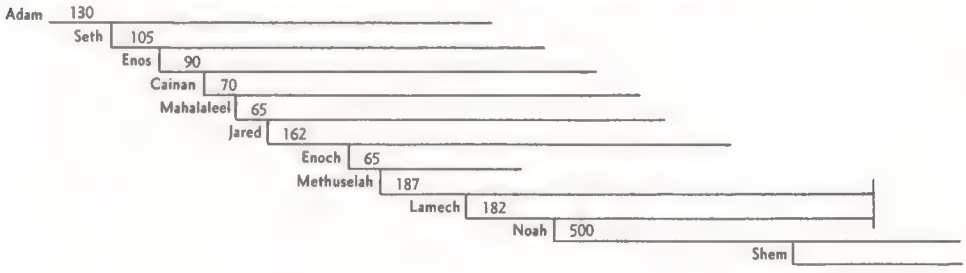
continually." "The earth was filled with violence." [9] As Seth's descendants intermarried with Cain's they also became corrupt, and few godly people remained on earth. When Methuselah died in the year of the Flood Noah and his family were the only righteous ones left.

Just how great the population of the earth had become before the Flood is hard to determine. Though the people of that time lived long and were without serious disease, there is little evidence that they increased numerically to any great extent. Of all the fossil bones that have been found of animals, reptiles, fish, birds, and marine life—presumably from before the Flood—there are few, if any, human bones we can be sure date from that time. No evidence has been found of man-made buildings appearing to have been occupied by pre-Flood giants.

The record tells us that Adam and Eve had only three sons (any daughters they may have had are not mentioned by name) by the time they were 130 years old.[10] Seth was 105 when his first son was born. The eight succeeding generations recorded, including Noah, averaged 165 years of age at the time of the birth of their firstborn. We are not told the size of their families, but judging from the fact that Noah in his 950 years had only three sons (at least only three are mentioned as having remained faithful), we could suspect that the birth rate was not exceptionally high and that the families of that time were possibly not much larger than they are today.

The population may also have been kept down by continual fighting.

Since people indulged in every kind of sin and depravity, and were continually fighting, it is likely that the population was kept down by murder, strife, and human sacrifices. Looking at more recent history, we know that Indians had been



Since man of that time evidently matured much later than now, it is possible that families then were not much larger than today.

living in North America for thousands of years before the coming of the white man, yet the country was only sparsely settled. Some historians estimate that there are more Indians in America today than there were in the time of the Pilgrim Fathers. Continual fighting between tribes was an important factor in the reduction of the population.

If Noah warned all the people on earth of the flood to come, and all were given opportunity to enter the ark and be saved, it would seem that man had not yet spread very far over the face of the earth prior to the Flood.

[1] Ellen G. White. *Patriarchs and Prophets.* Pp. 80-83.
[2] ———. *Spiritual Gifts.* Vol. 4, pp. 154-156.
[3] ———. *Ibid.* P. 120.
[4] ———. *Ibid.* Vol. 3, p. 34.
[5] ———. *Testimonies.* Vol. 3, pp. 138, 139.
[6] Gen. 6:4.
[7] White. *Spiritual Gifts.* Vol. 4, pp. 154-156.
[8] ———. *Patriarchs and Prophets.* P. 90.
[9] Gen. 6:5, 11.
[10] Chap. 5:3.

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4

How the Ark Was Built

THE EARTH WAS about to be destroyed by a flood of water. Noah and his family, along with selected animals, birds, and other creatures, were to be preserved alive in a large boat that they would build according to the directions that God gave to him. Noah may have hired some carpenters, and Methuselah and his sons helped for a time.[1] But Methuselah died in the year of the Flood, and his sons apparently lost faith and left the project.

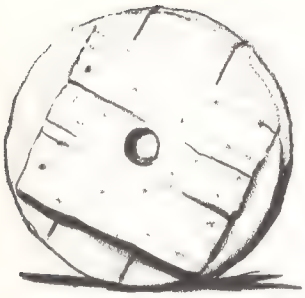
The neighbors jeered and ridiculed Noah as he warned them of what was to come. Why, the whole idea was stupid! A boat on dry land! Rain to overflow the whole earth! There had never been any rain—how could there be now? Where would it come from?

The details of how Noah accomplished the remarkable project are largely unknown. We are told that he used gopher wood, but we have no wood known by that name now. It has been identified with cypress or acacia, both of which we have in various parts of the earth.[2] Because of problems in translation and changes in language, Bible terms do not always convey the exact original meaning. Undoubtedly Noah had sturdy, fine-grained trees to choose from, perhaps species that do not even exist today. Remains of trees that are believed to antedate the Flood appear tall and straight; we can be sure Noah would have selected the best he could find.

Noah probably did not have a sawmill with which to cut his timbers. More likely, he and his sons cut the trees with axes or saws, then squared the logs with an ax in much the same way as did the woodsmen of America not so many years ago. The finishing could have been done with an adz, another tool easily made by the early blacksmiths.

The American Indians, clever as they were in hunting,

Gopher wood is believed to have been either cypress or acacia. These trees, as we know them now, would not have been very suitable for building an ark; but they may have grown quite differently in the pre-Flood world.



The invention of the wheel had not yet occurred to the natives of the Americas by the time Columbus arrived.

fighting, and building treasure cities in Central and South America, had not thought of the wheel by the time Columbus reached this continent. Yet we are surprised by what they were able to accomplish without this basic invention. Noah and his sons and helpers accomplished great things with simple tools by faithfully following God's instructions.

What the people of Noah's day lacked in mechanical inventiveness they made up for in time and strength. These men were powerful giants, 10 to 15 feet tall. They could easily handle timbers that to us would appear formidable indeed.

Noah's sons could easily handle timbers that to our puny strength would look formidable indeed.

Imagine them at work. Japheth chops down a tree with his iron ax, lops off the branches, and carries it on his shoulder to where the ark is beginning to take shape. The heavy keel has been laid. The inside framework is well along. The beams are of squared logs, notched and fastened with iron nails and brass bands such as Tubal-cain had taught men to make centuries before.

The sides of the boat are also built of squared logs fitted together, dovetailed and laminated, and joined securely to the framework. There has been no thought of making the boat light in weight, for there will be no need to launch it; the water will come to it. But it must be as strong and as watertight as possible, which calls for careful workmanship. The hull logs are daubed with pitch where they are joined together.

Noah and his workmen probably squared the logs with an ax as our woodsmen did not so many years ago.

The ark was enormous even by today's standards. Among the specifications given to Noah, the ark was to be 300 cubits long, 50 cubits wide, and 30 cubits high.[3] A cubit is the distance from a man's elbow to the tip of his second finger. It is usually thought of as being 18 inches long. Studying the measurements of the Egyptian pyramids has led archeologists to believe that the cubit, at the time the pyramids were built, was 20.625 inches. Moses was educated in the schools of Egypt; therefore it is possible that this was the measure he had in mind when he wrote Genesis.

According to the Egyptian cubit of 20.625 inches, the ark was about 516 feet long.

The Egyptian cubit would give us measurements of about 516 feet long, 86 feet wide, and 52 feet high. The volume of space would have been 2,307,552 cubic feet; making allowance for tapered ends, we could say 2,000,000 cubic feet. The floor space on three floors would be 133,128 square feet, or, with allowances, roughly 100,000 square feet. There were also nests and cages; undoubtedly the space was used as efficiently as possible.

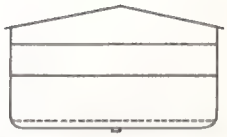
The larger animals probably occupied the lower floor; the ceiling of this area must have been high enough to accommodate the giraffes and the elephants, or their forerunners. Possibly there were animals and birds in cages between the floor and the ceiling, and alleyways among the stalls for Noah and his sons to use when feeding the animals. Of the clean animals there were seven of each kind; of the unclean there were only two of each kind.

When we consider that there are 840,000 species of animals in the world today we may wonder how that many could live in the ark. However, when we examine this figure it does not bulk nearly as large as at first glance. For instance 800,000 of the above number of species are insects. They take up so little room they could easily live among the larger animals. Second, only those forms of animal life that God created were taken into the ark.[4] Of the animals now living the ones that still interbreed probably came from the same original Genesis kind. Since dogs, wolves, foxes, and jackals interbreed, they could have been represented by one pair of animals in the ark. The same would be true of the deer family, the cat family, the antelopes and others, respectively.

To investigate the possibility of all the Genesis kinds' being able to get into the ark, let us do some computing. First we would analyze the records of all the animals in the world and try to determine which might have originated from common ancestors. Then we would estimate the amount of space each kind would need in order to be comfortable, compartmented by twos and sevens. In one estimate this came to a total of 60,000 cubic feet, 1/50th or 2 per cent of the available 2 million cubic feet in the ark. The estimated floor space needed would be 6,000 square feet, or 4 per cent of the space available.

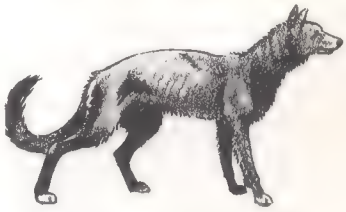
We could not expect such an estimate to be accurate. But it leaves so much leeway that we can be sure the animals had enough room for exercise and that there was enough room for the storage of feed. Thus it is entirely feasible that the original kinds could be taken into the ark.

When we divide the 52 feet of the ark's height into three stories we find that each would be 17 feet from floor to ceiling. A large giraffe is 18 feet tall so the lower story should be 20 feet high; the other two could be 10 feet each, allowing two feet for the thickness of each of the floors and 8 feet for the bilge. This would leave plenty of space for stalls, cages, nests, and whatever was needed.



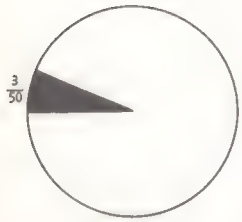
This scale drawing shows the end section of the ark as it may have been designed.

Of the 840,000 living species of animals today, 800,000 are insects, which take up very little room. If the pre-Flood ratio was similar this would help solve Noah's housing problem.



The entire dog family probably was represented by one original "kind."

The black portion of the diagram shows the *volume* of the ark that the estimated number of animals would have occupied.



Allowing standing room only, the amount of floor space the animals would occupy would have been about 3/50 of the floor space in the ark.

It has been suggested that some of the animals may have hibernated in the ark during the Flood.

The door of the ark probably opened onto the second floor, with inside ramps leading up and others leading down.

We do not know just what the animals ate while in the ark. It is difficult to imagine the carnivores suddenly returning to a vegetarian diet, yet we know that there were many ferocious animals in the ark with Noah. It may be that they lived off the excess in increase of the rodent population, as they do now. There always seem to be some animals, birds, and especially insects that multiply so rapidly that control measures are needed to keep them from overrunning their habitat.

The suggestion has been made that the animals taken into the ark were young, thus smaller and easier to control. This may be, but young animals require large amounts of food, which could be a problem. It has also been suggested that some of them may have hibernated during the time they were in the ark. If so, this would have reduced some of Noah's problems of care and feeding.

According to Genesis 6:16 the ark had a window, but the meaning of the text is not clear. Some commentators suggest that there was an opening one cubit high, on both sides of the ark and running full length, just under the eaves. This would help ventilate, let in some light, and still keep out the rain. How the ark was lighted we do not know. During the first forty days there was probably not very much light outside anyway.

The ark had a door in the side that probably opened onto the second floor. The door was big enough for the largest animals to enter; it fitted tightly and was closed by the Lord Himself, seven days before the rain began. The animals evidently entered by a ramp, probably the same one used by Noah and his sons to carry the materials used in the building of the ark. Inside there likely were other ramps leading to the first and third floors.

We would expect that Noah stored a large quantity of hay, grain, nuts, and fruit, perhaps on the upper floor—food that would keep under the less-than-ideal conditions that prevailed during the Flood. Noah also kept some seeds to plant after coming out of the ark.[5] There may have been holes at intervals in the loft floor through which hay and other feed could be thrown down to the lower floors. Quite a number of animals probably roamed loose and fed together, and what was wasted by one was food for another. Some, no doubt, had to be fed in their pens, especially the large carnivores.

Practical souls may have wondered what Noah did with

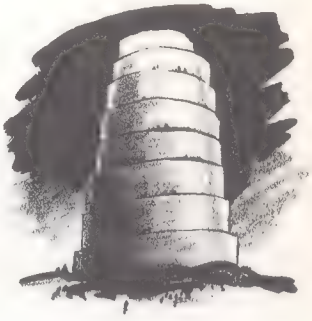
all the dung that accumulated from the many animals. It is possible that the floor was made of spaced planks that allowed the dung to fall into the bilge below the lower floor. Here bacteria, insects, mice, and shrews would work through it as they do today, aerating it and allowing natural decay to change it into an odorless compost. The warmth generated would help to keep the animals and birds comfortable. This system has been used by some farmers who raise beef cattle and they have found it to be practical.

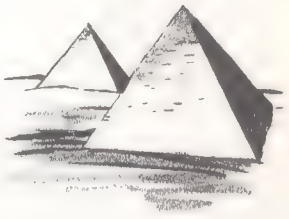
Some may wonder how men in those early days could conceive and accomplish so large a project as the ark, for which there was absolutely no precedent. Remember that Cain built a city in the Land of Nod and named it after his firstborn. This was some centuries before the time of the ingenious children of Lamech. What the abilities were of men just before the Flood we know only in a general way. They vied with one another to build ostentatious homes, even as men do now.

Consider what men built shortly after the Flood. Nimrod built a city, and then the people began building the Tower of Babel that was to reach to heaven. Some time later, the pyramids and treasure cities of Egypt were built with great skill and unbelievable accuracy. How men with primitive tools could cut and polish huge stones, move them great distances, hoist them on top of one another, and make them fit; how they could predetermine the height of the pyramid from its base, and how they could plan it to come out as a beautiful symmetrical form, is a marvel indeed! Not long after that some of the other wonders of the ancient world were constructed.

When we study in detail some of the earliest creations of man we have a better idea of what manner of men they were, and what powers of mind and body they received from their Creator. They were far different from the primitive subhumans that some would have us believe were the ancestors of modern man.

A number of the animals, birds, and insects likely fed together as they do now, thus occupying the same area.





We may wonder how those early men could conceive and build a boat the size of the ark. We know, however, that their descendants built such marvels of construction as the Tower of Babel and, shortly after, the pyramids.

[1] Ellen G. White. *Patriarchs and Prophets.* P. 92.
[2] ———. *Ibid.* P. 95.
[3] Gen. 6:15.
[4] White. *Spiritual Gifts.* Vol. 3, p. 75.
[5] ———. *Ibid.* Pp. 76, 77.

For Further Reading

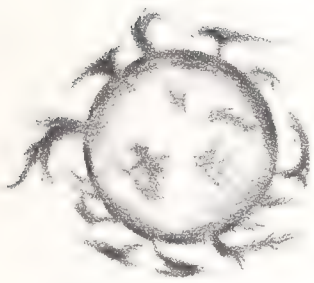
White, Ellen G. 1890. *Patriarchs and Prophets.* Chapter 7.

5

Fire on the Moon, or a Tilted Earth?

MOST OF US know well the story of the animals walking two by two into the ark, and of Noah and his family waiting an entire week inside the closed ark while their neighbors jeered and ridiculed. We also know of the sky suddenly darkening, the thunder roaring like the voice of the Almighty, and the big raindrops beginning to fall, then faster and faster till there was a cloudburst and a heavy rain that lasted 40 days and nights. We understand that God brought this about. He predicted it and had Noah prepare for it, but what were the physical means He used? What changes, if any, were there in the laws of nature that made it possible?

God can and does work miracles on a grand scale, but He usually works within the framework of His own laws.[1] He is a God of law and order. Before the Flood the earth had been watered by heavy dews that came at night in harmony with natural laws in force at that time. Since the Flood the earth has been watered by rain, according to other well-known laws that involve evaporation, humidity, air saturation, temperature, warm and cold fronts, and pressure areas. Before the Flood a different situation must have existed. What happened to the laws of nature that caused a worldwide flood and a change in the method of precipitation?



Astronauts have found evidence of volcanic action on the moon, but did it ever burn like the sun?

Some people think that there had been fire on the moon and it went out. They suggest that the moon may once have been a burning orb like the sun. According to their theory, when God extinguished the fire the reduction in temperature on the earth was enough to condense most of the moisture in the atmosphere and it came down in a 40-day rain. Isaiah 30:26 is quoted in support of this theory. Isaiah describes an ideal world to Israel as the reward of obedience, saying, "The light of the moon shall be as the light of the sun,

and the light of the sun shall be sevenfold." Some people read into this that since it will be that way in the new earth, it must have been that way in Eden.[2]

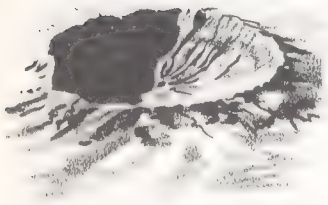
This scriptural statement may not offer very substantial support to the fire-on-the-moon theory, but astronauts have brought back evidence that the moon does contain some molten rocks and may at one time have been hot. The surface of the moon is scarred with many craters that, with the intervening "seas," make the impression of a face on the moon. Firsthand study may soon give us still more definite information as to the formation of these craters, but according to evidence now available they could be of volcanic or meteoric origin.

The earth's atmosphere is daily bombarded by flying objects from outer space—falling stars or meteors. Most of these are burned up in the atmosphere and never even reach the earth's surface. (They are called meteorites if they do reach the earth.) Some large meteorites have struck the earth with such impact that they have left immense craters such as those in Arizona, Ungava Bay, the Carolinas, Siberia—and one 400 miles wide in Hudson Bay.

The earth is continually being bombarded by flying objects from outer space, few of which actually reach its surface.

UNITED STATES NAVY PHOTOGRAPH

The surface of the moon is covered with craters.



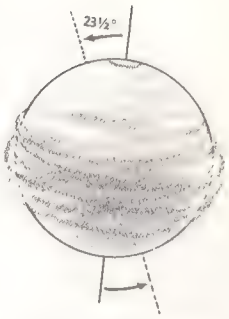
Meteors have struck the earth with such force that they have left huge craters in Arizona, Ungava Bay, the Carolinas, Siberia, and other places.

The moon is subject to the same bombardment as the earth, but because it has no atmosphere it is constantly peppered with star-dust and meteorites that do not burn up, but accumulate on its surface. Large meteorites can, of course, make large craters, and because there is no wind, weather, or vegetation, these scars are retained and others are superimposed upon them. This is the picture we have of the moon. Some of the craters appear to have been made in volcanic dust, some in hard earth, and others look as though they were made in a molten surface. At present we cannot definitely determine the significance of this, but it is possible that some day we may know more about fire on the moon.

Another theory on the physical means used to bring about such a catastrophe as the Flood is that the Creator tilted the earth on its axis.[3] We know that today the earth turns on the axis of its poles at an angle 23 1/2 degrees to the axis of its rotation around the sun. If the earth was rotating at right angles to the sun at Creation, the amount of sunshine would

have been the same in the polar regions day after day even though the amount of heat would have been considerably less than in regions nearer the equator. This means that there would have been no long polar nights such as there are now, and no summer or winter. If, in addition to this, warm water from the tropical zones circulated through connected channels to the polar seas the climate would have been more liveable there.

If the earth did tilt it could have happened gradually and been part of the curse that came as a result of sin. It could have begun slowly and increased more rapidly just before the Flood. It could have been the main factor in bringing about the Flood or it may have been only a contributing factor. Of course we cannot be sure that it took place at all, but there are several indications that it may have done so, as we will see later.



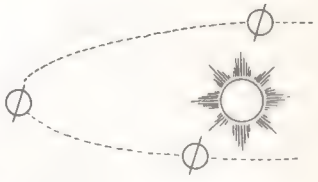
A shift in the earth's axis could cause severe pressures on its crust.

A shift in the earth's axis such as we have mentioned could have other effects even more drastic than a change of climate and seasons. Hold a spinning top and try to change its axis with a pencil. There is a strong force resisting such a change —we call it centrifugal force. If you persist in changing the axis you will notice a strong tendency for the spinning top to wobble. The earth would have done the same.

A strong force resists any change to the stance of a spinning top.

Imagine what would have happened to the earth had it been shifted in this way. The water in the seas would have overflowed the banks because it would want to continue in the direction it had been going. This could be what the Bible means when it speaks of the fountains of the deep breaking up. The "deep" could refer to the seas or to subterranean water channels.

In addition, under the stresses occasioned by the change of the plane of the earth's rotation there would be great pressures that would cause the movement of large sections of the earth's crust. This could result in a wrinkling of the surface as is exemplified by the Allegheny mountain range. It could push up mountain ranges or form faults or cracks. It could pull apart large land masses, creating oceans. Some of this could happen rather quickly, other changes could occur more slowly, as will be discussed more fully in a later chapter. This mechanism may have operated either before or after the Flood—or perhaps both. The continents of today apparently bear little relationship in shape to those of the pre-Flood world.



What would the climate on earth be like if its axis were not tilted 23 1/2 degrees in its rotation around the sun?

An old Indian who lived in the rain forests on the coast

A West-coast Indian could not understand how 40 days of rain could flood the entire earth.

of British Columbia was inclined to doubt the story of the Flood. He could not see how 40 days and nights of rain could cover the earth. "Why, here," he said, "it rains every day in the year and the 'chuck' doesn't rise one inch." His own little world was very wet but he forgot the vast areas of the earth's surface where rain seldom falls. A universal rain could quickly raise the level of water in the rivers and oceans of the world, aside from all the other sources from which water could come.

[1] Ellen G. White. *Testimonies.* Vol. 6, pp. 185, 186.
[2] ———. *Ibid.* Vol. 8, p. 42.
[3] Harold W. Clark. 1946. *The New Diluvialism.* Pp. 96, 97.

For Further Reading

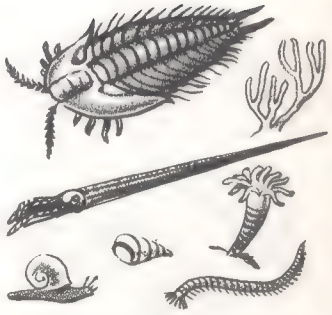
Clark, Harold W. 1946. *The New Diluvialism.* Chapter 4.
Coffin, Harold G. 1969. *Creation—Accident or Design?* Chapters 6, 7.

Marine life grew on the floors of the pre-Flood oceans.

6

Seashells at Timber Line

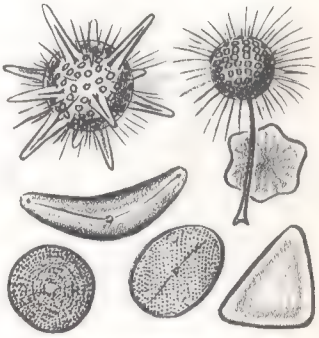
ON THE FLOORS of the warm, comparatively shallow seas of the pre-Flood world, life grew in great profusion. The many-jointed trilobites, which looked like giant sow bugs, fed on the wastes of the sea bottom. Shellfish of many kinds proliferated. Ammonites with long, twisted shells; nautiloids, like squids popping out of cone shells; various species of snails; and brachiopods and clams, littered the ocean floors. Sponges of several varieties grew in forms similar to those we have today. Sea anemones were common; crinoids, or sea lilies, grew underwater like fields of flowers, waving their heads on graceful stems with every movement of the water. Corals were particularly abundant and formed extensive reefs in the warm waters of the primordial seas.



Sea creatures grew in profusion on the beds of the shallow pre-Flood seas.

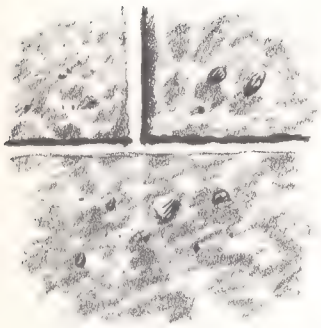
In the deeper water where such forms of life could not live there were many others such as the diatoms, radiolaria, and foraminifera. These microscopic plants and animals lived near the surface of the water then as they do now. They built their tiny, delicate bodies of silica, lime, or sulphates; lived and died, then their bodies like fine earth settled through the water to rest on the bottom of the ocean.

These foraminifera, diatoms, radiolaria, and related forms are so abundant in the oceans today that their bodies, or rather their exoskeletons, form a deep ooze that covers much of the ocean floor like a heavy blanket of snow. It evens out such irregularities of the sea floor as boulders and shipwrecks into rounded forms. In ancient seas these minute organisms multiplied even more rapidly than today, forming vast deep layers.



Microscopic animals with delicate bodies of silica, lime, or sulphates lived in the deeper waters.

In addition to all the shell life and the microscopic plants and animals that produced the diatomaceous earth, silicates, and other deposits, there were also large beds of coral,



Small snail or clam shells are often visible in the limestone blocks of buildings.

sponges, and moss animals that contributed to the calcium layers that were settling in the water. Slowly, slowly, under the sea, cities of coral are builded. So goes an old poem, and it may indeed seem slow to us, but it is persistent and unremitting.

Year after year coral grows and grows into large reefs, atolls, and islands. In the pre-Flood world with its warm seas and constant temperatures, the corals multiplied greatly and formed extensive accumulations that now contribute to the strata of limestone exposed in canyons and outcroppings. The close-set, round cross-sections of the various corals are common in fossil rocks.

In the world before the Flood there were, as we have mentioned earlier, large forests of trees that grew luxuriantly. The mild climate and abundant moisture of that time encouraged a rank growth of trees (many varieties of which are entirely strange to us today). Now we find such tree growth only in jungles and rain forests in parts of the tropics and in coastal regions that have an exceptional amount of rainfall. At that time, however, a rich growth of trees was more nearly the norm. There were, it is true, grassy fields and open hills, but there were no vast treeless deserts, no wide open plains with trees only in the gulleys, no barren tundras with only grass, lichens, and dwarf willow.

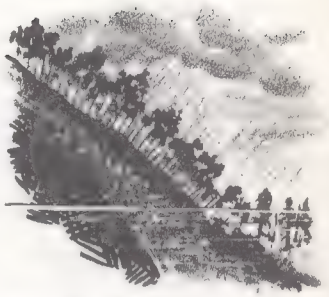
The earth did not change immediately after the Fall. Trees still grew tall, and vegetation was lush.

Think how many forests there could be compared to what we have today! Think, too, how greatly that amount would be multiplied if our oceans, which cover 70 per cent of the earth's surface, were reduced to pre-Flood channels! This gives us some idea of the material that was available at the time of the Flood to produce our present seams of coal. We are told that it takes 10 feet of forest products to produce one foot of coal. This fact does not favor the theory that coal was formed by the slow accumulation of peat in bogs, when we remember that some coal seams are 30 to 40 feet thick.

We have mentioned some of the organically formed materials that have gone into the making of the sedimentary layers of the earth. There are also large amounts of silt or mud that have turned into strata of shale, there are sand deposits that have turned into sandstone, and there are layers of gravel and rock that, under pressure of sediments above them, have turned into conglomerate rock. Lime and silicates have acted as a cement to bind these materials. We need not explain where these came from, for they are now, and always have been, abundant everywhere.

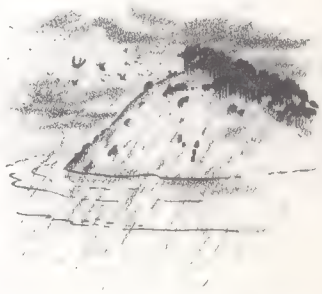
When we look at the geologist's chart of the earth's strata we see that above the granite foundation rocks of the earth, the first layers of sedimentary rocks contain a few marine fossils but are composed of shale and sandstone. When the earth was created and the continents rose out of the waters of the deep, loose sand and mud flowed off them to form the first layers.

Marine life began to swarm in the waters at God's command; later, as the streams and rivers carried silt into the ocean, many of these creatures were buried in it. On top of this, deep deposits of lime and silicates formed from the billions of microscopic animals and plants mentioned previously. During the upheavals that took place at the Flood, large amounts of this ooze could have shifted from higher places to lower ones, accounting for the great depth of some of the lime deposits.



As the flood waters increased, entire hillsides slid into the depths.

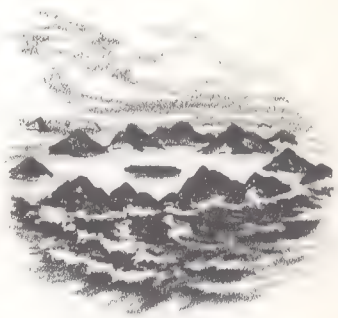
As the flood waters increased, vegetation was uprooted and drifted down the rivers to the open water to form large rafts of trees and other plants. These rafts became dense and compacted as they were buffeted by winds and waves. In time they became waterlogged, settled, were covered with layers of sediments, and hardened into coal. As mountain systems arose after the Flood these strata of silt, sand, lime, and coal were tilted, bent, dropped down, and in some cases turned over. The waters of the Flood, especially in the early stages, did not necessarily cover the whole world all the time, and in some cases the newly uplifted mountains may have provided a temporary refuge for some fleeing animals till the terrible storms obliterated everything.



When the waters rose many animals were trapped on hilltops and drowned.

When the rising waters reached the ark it was buoyed up and set afloat, along with its precious cargo of life. It had no means of guidance or locomotion, but was driven about by the wind and waves under the watchful eye of God. Toward the end, when the storms were most violent, it was guided to the shelter of a group of mountains, later called Ararat, which rose above the roiled waters.[1] Here it rode out the worst of the storms and rested as the waters subsided.

During the Flood immense waves, caused by the uplifting of mountains, by earthquakes, and by underwater volcanic activity, swept unhindered around the world. In addition to these giant waves, furious storms such as this world has never seen before or since, raged in unrestricted fury, carrying off the tops and sections of mountains and washing them away.[2] All this debris of rocks, gravel, sand, and earth was carried



When the storms began, the ark found refuge in the shelter of the mountains of Ararat.

The elements went wild during the catastrophe.

Forests were uprooted and carried in vast rafts on the stormy waters.

along by the waves in their violent flow and settled in the lower depths—the larger rocks first, then gravel, sand, and earth, often in sorted layers as we find them now in some places.

In the Grand Canyon and many of the surrounding areas that are deeply eroded we can see layer upon layer of deposits right down to the granite bedrock at the bottom. We can identify the layers by the types of rocks of which they are composed. Geologists have carefully studied these strata and named them, and they can recognize them when they see outcroppings elsewhere, or in the borings that come out of oil wells. They can also recognize them by the fossils that are found in them.

Strata that are seen in the deeply eroded Grand Canyon are continuous underground over large areas, as the cores of oil wells show; and they are found to be in the same order wherever they appear. Sometimes the top layers are eroded away, sometimes one of the layers thins out and disappears, sometimes one is replaced by another. Some layers are very thick, others are quite thin. The thin layers may extend over hundreds of miles of country. There is no river on earth today that could spread a thin strata of silt evenly over so large an area. Everywhere there is evidence of vastly more water than exists in any one place on earth today, and of erosion on a scale we find difficult to imagine. The picture of a universal flood is the only one that can serve as a model.

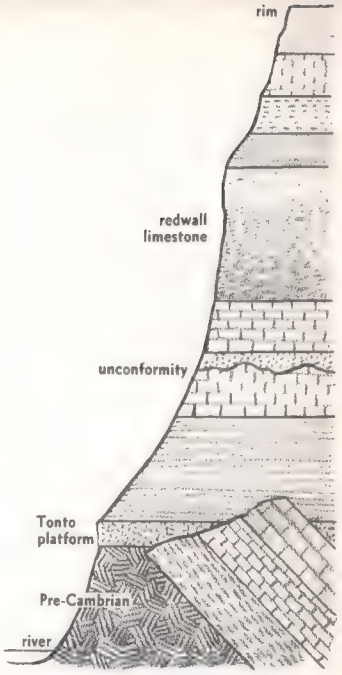
During this time of violent storms and water movements, much of the primeval forests and dense vegetation that had been uprooted earlier was still floating on the waters. Some that had been buried was washed down again from the uplifted mountains, and these vast acres of flotsam were carried by the waves and the storms till they rested on the shoulders of new mountain ranges or were trapped in enclosed seas. Here they were buried by new silt-laden waves from eroded mountains or by volcanic ash and lava.

All this buried vegetation changed to coal, under pressure of the silt and with air excluded. Coal seams are found in many successive layers and certainly need not all have been laid at one time.

Ash and lava from volcanoes began to play a more and more important role in the formation of the sedimentary layers laid down during the Flood, but later volcanism became even more significant as an earth-shaping factor.

Slowly the waters began to recede and the high land appeared above the water. Imagine the world at this time—sodden and loose from all the soaking, shaking, pulling, and warping of the surface. As the waters continued to recede, giant rivers drained the land from the heights to the sea. Their flow through the wet landscape caused exceptionally rapid erosion. They quickly cut deep gorges through the silt that had filled the valleys. In a short time great canyons were formed that would have taken ages to erode out of the rocks in their present hardened state.

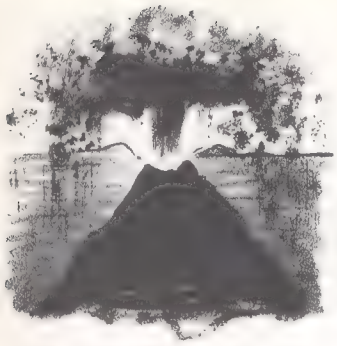
In places large seas were impounded by upheaval, or lakes were locked in closed valleys. Then as the dams broke the waters found their way out in a tremendous rush, tearing out wide valleys and spreading and depositing gravel in still



In the walls of the Grand Canyon and other deep earth cuts we can see layer upon layer of sediments deposited by the Flood.

Immense waves battered down and carried off the tops of mountains.

In a number of places large seas were impounded by rings of mountains, only to break out and again flood the valleys.



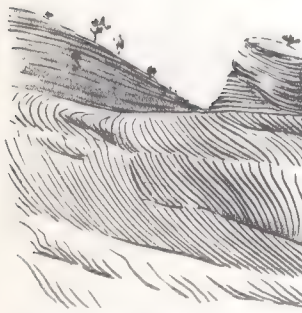
Ash and lava began to play an important part in supplying the material that made up the layers.

more layers in lower places that may already have had some of their original strata eroded away. Thus we see a complex picture of erosion and deposition being built up in a relatively short time, but this was still not the end!

The wind that God caused to blow as His agent in drying up the earth soon swept with it much of the loose sand and dust, and drifted it, covering large areas. If we examine cross sections of sand dunes we see that the sand is not usually laid down in horizontal layers. The bedding is mostly at an angle, sometimes many angles. It can produce weird patterns and shapes as may be seen in Monument Valley and in road cuts in southern Utah. Of course wind deposition and erosion did not end with the Flood, but has continued ever since, all over the world. This is also true of volcanism, with which we will deal again later.

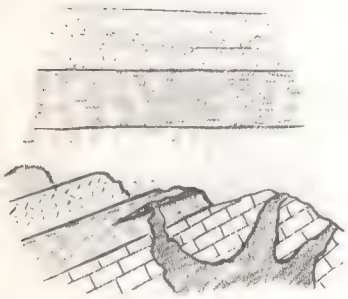
All this activity has built up, torn down, and mixed material so thoroughly that now there is little resemblance to the world that once had been made by the Creator. The high places are low and the low places are high, and the shells that were once on the bed of the sea are in many cases lifted to the tops of mountains at timber line.

When Noah and his family eventually left the ark and looked upon the earth it must certainly have seemed a bleak and desolate place compared to what it had been before. In one year enormous changes had taken place. They needed a rainbow to reassure them of God's love and care. Soon, however, the seeds and roots of plants that were near the surface began to grow, and patches of grass and flowers came up here and there to provide food for the animals. Noah planted the seeds he had taken with him in the ark, and in due time the world became green and comparatively beautiful again.



As the earth dried, the wind blew sand and dust into strange cross-bedded layers, quite different from those laid down by the Flood.

[1] Ellen G. White. *Patriarchs and Prophets.* P. 105.
[2] ———. *Ibid.* Pp. 99, 107, 108.



We find that strata were laid down, then uplifted, then eroded, and after that sometimes new deposits formed on top of them. Altogether they formed a complex pattern.

For Further Reading

Clark, Harold W. 1967. *Genesis and Science.* Chapters 5, 6.
Coffin, Harold G. 1969. *Creation—Accident or Design?* Chapters 7-9, 14-16.
Scientists Panel—1971. *Creation, Nature's Designs and Designer.* Chapter 5.

The wind not only deposited layers but also eroded previously made formations into weird and fantastic shapes.

7

The Changing Landscape

THE VIOLENT ACTIVITIES that, during the Flood, disturbed the equilibrium of the world did not cease when the waters dried up. Winds still blew; rain fell; volcanoes poured out lava, broken rock, and ash; and earthquakes still caused the earth to tremble and the waters to rage. The earth continued to be torn at intervals by great faults that on one side of the crack lifted the crust high into saw-tooth ranges and on the other side dropped it.

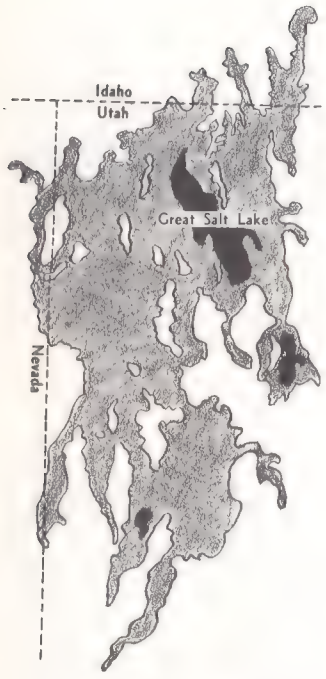
We are so used to thinking of the earth's surface in terms of a plowed field, the pasture, or the gravel pit back home, that it is hard for us to grasp the magnitude of events that took place during the Flood and after. We are inclined to limit the power of God to our own strength or to the most powerful machines that man can construct. For this reason it is helpful for us to look at some of the upheavals from an airplane in order to view the larger picture. From greater heights we recognize familiar patterns, but on a much grander scale.

We are inclined to think of the surface of the earth in terms of a plowed field.

After the Flood the climate of the earth apparently remained mild for a while. There are fossil remains of tropical plants and animals in the volcanic deposits of our Northwestern States, as well as other temperate areas, that indicate these regions must have been quite warm for some time after the Flood. The animals represented by these fossil bones must have had time to migrate to this country from Asia, establish themselves, and multiply here before they were buried by ash and fossilized. This would involve a minimum of perhaps 50 to 100 years.

After Noah came out of the ark God promised him that "cold and heat, and summer and winter . . . shall not cease."[1] This also suggests that the earth could have been tilted at the

From the air we get a view of uplifting, faulting, and erosion on a much grander scale.



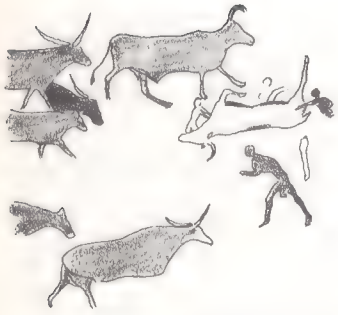
The Great Salt Lake, in Utah, was at one time far larger than at present.

time of the Flood and that seasons began then, for they are dependent upon the tilt of the axis of the earth. If this had been a gradual process the seasonal change would not have been as great at first as it is now. As the extremes increased, however, the cold of winter would be too great for the tropical animals and plants.

Some may wonder what happened to all the water that covered the earth during the Flood. Some of it naturally returned to the sky as clouds when it was evaporated by the wind. But most of it filled the oceans, which are now far larger and deeper than they were before the Flood. Rainfall was apparently more evenly distributed over the earth right after the Flood than now. Some mountain ranges had already risen to cut off moisture-laden winds coming from the oceans to the continents, but the Rockies, Andes, and a number of the other newer mountain ranges probably came up a little later. Fossil and archeological evidence tells us that the Sahara was at one time habitable and occupied by men, animals, and plants.[2] The same is true of the dry areas of the Middle East, the Gobi, the Kalahari, and the Australian deserts.

Large shallow seas were left in a number of places after the Deluge. The Great Salt Lake of Utah is only a small remnant of a lake that was once 20 times as large and contained 500 times as much water. Part of it flowed north through the Snake and Columbia rivers to the sea, and the rest evaporated, leaving the salty residue of the present lake and the extensive salt flats adjoining it.[3]

Manly, Mono, and Searle are other lakes in the Southwest that have entirely or partially disappeared. Examples from other parts of the world are Lake Chad in North Africa, Lake Eyre in Australia, Lop Nor and Balkhash in Siberia.[4] The Aral and Caspian seas not only were at one time larger but were also connected with the Black Sea. Most of these lakes may have retained their water until after the glacial era, then shrank from lack of rainfall and from evaporation. Some disappeared entirely.

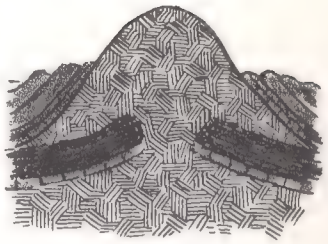


Cave drawings in the Sahara desert indicate that it was at an earlier period much more habitable than it is now.

The level of the continents rose and fell at various places after the Flood. Sometimes it was a matter of the ocean's rising and falling, at other times it was the land. The change was most obvious at the coast lines. A land bridge between Alaska and Siberia may have been a factor in preserving the mild climate in the Northwest, since it would have prevented the cold water of the Arctic from drifting down the coast.

Among the changes that came to the earth during this

time of readjustment was the appearance of additional mountains and mountain ranges. These were formed in several ways, all dependent to some degree on the fact that the earth is partly molten beneath the crust. This magma sometimes finds its way up through the mantle and oozes through cracks in the crust to the surface as lava. At other times it is blocked by a heavy mass of rock that it cannot penetrate. Then as it accumulates underneath it pushes up this mass into a huge rounded range of mountains. Examples are found in the Henry, Uinta, Bighorn, and Wind River mountains of Utah and Wyoming.



Some mountains were pushed up by rising magma from below.

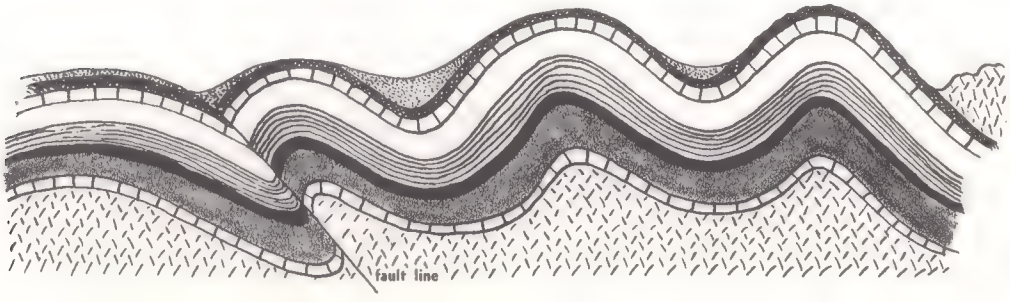
Another form of mountain building is that which produces folded ranges. The Appalachians in America, the Alps and Urals in Europe, and the Atlas Mountains of North Africa are examples of places where the earth's crust was pushed together, forming wrinkles. What caused the pushing is not altogether clear in every case, but it is evident that powerful forces were at work during the Flood and afterward.

Geologists used to think that the main force that caused the wrinkling was the shrinking of the earth due to cooling from a prior, overheated state. This, they say, would wrinkle it in its weakest places. The mountain ranges on earth would be compared to the wrinkles of a dried prune. Enormous difficulties face this theory. The folded mountains are usually made of sedimentary deposits of lime and fossil marine life in crumpled layers. How could these fossils have grown and been deposited if the earth was so hot?

Some have said that the folding was caused by erosion. But the character is one of violent, worldwide action, not a slow, gradual process. Also, how could erosion produce distorted layers?

A more plausible theory is that the folded mountains were caused by changes in the speed of the earth's rotation.[5] This could have happened when the earth's axis was tilted, as we have assumed, during or after the Flood. This would have caused great and possibly sudden pressures. Geologist Eduard Suess claims that the folded mountains were all formed at approximately the same time.[6]

Folded mountains were formed when sections of the earth's crust were pushed together and the layers buckled.



The pushing pressures caused by a shift in direction of the spinning earth would have resulted in compression of the earth at its weakest places. These places were probably the ocean beds of the pre-Flood world where the layers of marine fossils were deposited. Because the crust was thinner here it would give way and the layers would wrinkle, fold, and even push one on top of another in some areas through the power of disturbed momentum.

The pull of such a force would be least at the poles and equator and greatest at about 45 degrees latitude.[7] This is where many of the folded mountains are. Tensions would be great for a time, but would slowly decrease as the earth regained its equilibrium. It may be that the shift came suddenly, or over a period of a year or several centuries. The earth does wobble slightly, and the magnetic poles have changed location; it may not be too improbable that this is a result of a change of axis.

Many of the folded-mountain chains are bowed in such a way that the source of the pressure is indicated.

Wherever the crust of the earth was pushed against solid shields of granite it curved around. Many folded mountains are bowed in such a way that the direction of the forces that formed them can be determined.

Some geologists promote still another theory on how folded mountains came to be. They think there are slow convection currents in the magma under the earth's crust that tend to push land masses together in places and compress them, causing folds. In the next chapter we will discuss other ways in which the earth's crust has been changed and how other mountains have been formed. Some things that have happened help us to understand better why this last theory is considered plausible.

[1] Gen. 8:22.
[2] Life Nature Library. 1961. *The Desert.* Time—Life Books, New York. P. 132.
[3] *The Reader's Digest.* 93:557, September, 1968. Pp. 181-185.
[4] William C. Putnam. 1964. *Geology.* Oxford University Press, New York, N.Y. Pp. 314-316.
[5] Harold W. Clark. 1946. *The New Diluvialism.* Pp. 96, 97.
[6] ———. *Ibid.* P. 98.
[7] ———. *Ibid.* P. 97.

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8

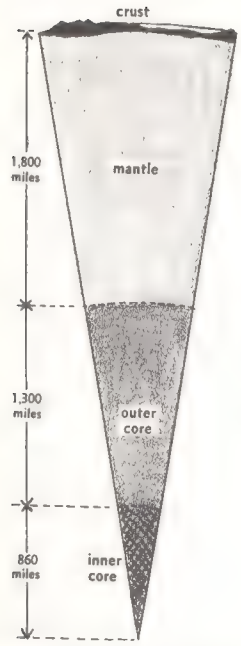
When "Terra Firma" Trembles

OBSERVERS ON HIGH ground said the earth before them rose and fell like long swells of the sea. Trees tilted, interlocked branches with each other, then waved them as they separated. The earth cracked as it bent upward; out of the cracks spewed sand and water. Large areas of the countryside were lifted while some areas sank and filled with water. Steep bluffs and hillsides in Illinois, Missouri, and other States, slid into the Mississippi River. This created great waves that overturned ships and barges and washed others high onto dry land. On shore the big waves broke off thousands of trees and washed them back into the river. Whole islands disappeared, and in places the river changed its course.[1]

This happened in December, 1811. The convulsions continued intermittently for years—the last shock of the series came in March, 1822, bringing to a close the worst series of earthquakes ever to shake America in historic times. It centered near New Madrid, Missouri, not far from Cairo, Illinois, and covered an area of about one million square miles extending from the Canadian border to the Gulf of Mexico. Few knew about it, because it happened in a part of the country that was largely uninhabited; thus relatively few people were killed or greatly disturbed. By the time the news reached the Eastern States the War of 1812 occupied most of the headlines.

In the San Francisco earthquake in 1906 about 450 people lost their lives. In 1755 when "Lisbon town saw the earth open and gulp her down,"[2] 60,000 perished. The 1923 earthquake killed 100,000; in Calcutta 300,000 perished in 1737. The all-time record of 830,000 casualties is claimed for Shensi province, China, in 1556.[3]

To us the earth seems quite firm, so much so that we speak



The crust of the earth is only a very thin portion of it, as this cross section indicates.

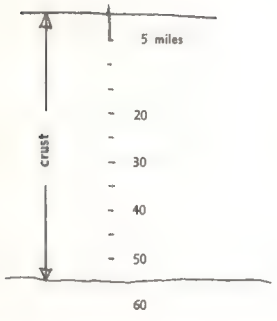
of it as "terra firma." Compared to water it is certainly firm, but we can also say with Galileo, though in a different sense, that it "does move." We know that the water in the ocean is affected by the gravitational pull of the moon and sun to form daily tides; but few of us realize that the earth itself also has a tide, and that the continents rise and fall six inches every day. The reason for this can be seen from a study of its structure.

The composition of the earth is roughly illustrated by the wedge-shaped cross section in the marginal diagram. The outer crust ranges in thickness from three miles at its thinnest places under the ocean to 40 miles or more at its thickest (the mountain ranges). The average thickness is about 20 miles. This crust is composed of rock, gravel, sand, and earth.

Under the crust is a 1,800-mile-thick section called the mantle, composed entirely of rock that is nearly molten, but not quite. Next there is the outer core, 1,300 miles thick, believed to be molten iron; and the inner core, 860 miles in radius, apparently different in composition from the outer core.

How do the geologists know all this? The deepest mines or oil wells are no more than five miles deep. This means that we have barely probed the surface. Talk of drilling a well to China is fantasy of the most extravagant nature, possible only in science fiction.

The temperature of the deep mines increases one degree Fahrenheit for each 60 feet in depth. If this rate held good to the center of the earth it would be hotter there than on the surface of the sun. Actually scientists believe it is only between 4,000 and 8,000 degrees at the earth's center, while the sun's surface is believed to be 10,000 degrees Fahrenheit.



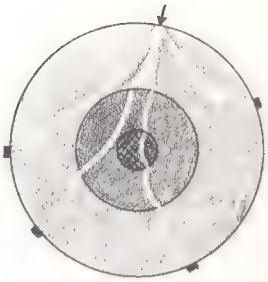
The deepest oil wells have penetrated the crust to a depth of only about five miles.

Pressure causes the interior of the earth to be hot. Atmospheric pressure, the weight of air, is 15 pounds per square inch at sea level. Five miles down in the sea the weight of the air and water is 100,000 pounds per square inch. At the bottom of the earth's crust where the mantle begins, the pressure is around 800,000 pounds per square inch. This, incidentally, is where it is believed diamonds are made—under intense heat and pressure. The ones we find have been spewed up through what are called "diamond pipes," or cores, to the surface of the earth.

Since rock melts at 1,000 to 3,000 degrees Fahrenheit and the temperature of the mantle is well above that figure, we would expect it to be molten. It is not, however, but is be-

lieved to be a semipliable mass like a too-rich mixture of asphalt on a road in the heat of summer. The great pressure of the crust above the mantle keeps it solid. When the pressure is partially relieved by a crack or an upward bulge of the crust, the mantle becomes molten in that place and flows up and sometimes out.

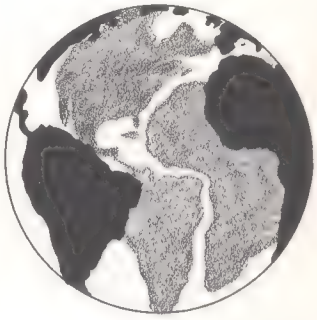
Before going further we should answer the question we raised a few paragraphs back: "How do geologists know that there are four distinct layers inside the earth?" It would seem that the mass of the earth would be hotter and more fluid nearer the center, without any definite zones. Geologists used to believe this, but a study of shock waves from earthquakes recorded by seismographs around the world showed these waves to be deflected at certain depths. This indicated that there are changes in the earth's structure, fluidity, or composition at these places.



By studying the shock waves of earthquakes we know that there are differences of structure or composition in the interior of the earth.

Bearing in mind the liquid core of the earth, the soft mantle, and the thin crust of rock, it is easier to understand how some of the vast, earth-shaping events could have taken place on our Father's world. When we consider that the depth of the ocean leaves the crust only three miles thick in places we can more easily see how whole continents might have moved apart as though they were floating islands on a mighty sea. An increasing number of scientists are beginning to think that the "Atlantic River" the airlines claim to have created by speeding up travel between the Americas and the Old World may actually have existed at one time.

A study of rock types and formations in Africa and Brazil has convinced some geologists that these continents were once close together and have pulled apart. The jigsaw puzzle appearance of their respective coast lines first suggested the idea. If reports are correct Arabia and India are still moving apart at a slow rate.[4]



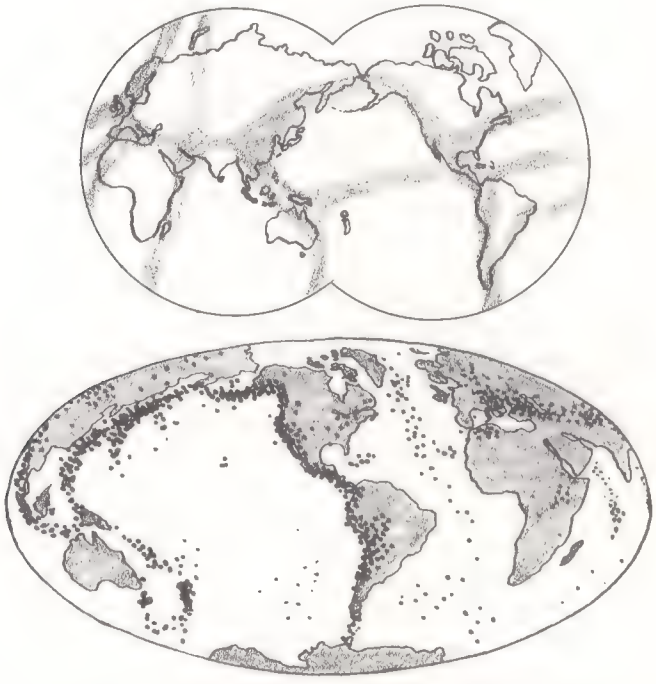
The Atlantic River may once actually have existed before the continents drifted apart.

Oceanic studies have revealed, for instance, the Mid-Atlantic Ridge, a chain of volcanic peaks and fissures from which lava flowed—and still flows in places. This is believed to be a crack in the crust that widened as the up-welling lava forced the Americas to drift away from the Old World, or else the continents drifting apart opened the crack for the lava to flow.

What happened on the sides of the continents opposite the apparent rift? Detailed oceanic maps show a sudden drop there instead of a wide continental shelf. When we compare the eastern and the western coasts of both North and South

America, the western portion of each continent appears to have slipped over the ocean floor, making room for itself.

In one way the earth exhibits some of the qualities of a filled hot-water bottle. Push down on it in one place, and it bulges tautly over the rest of the surface. The unevenness of the earth's crust, however, causes it to react more irregularly. Because of their greater weight the masses of the continents bulge down into the mantle farther than do the seas. The portions where the great mountain ranges are located settle down still deeper into the mantle. Great masses of ice such as continental glaciers also exert a lot of pressure. The Scandinavian peninsula is still slowly rising as it recovers from the burden of ice that weighed it down during the ice era. Geologists say it has 650 more feet to rise before it reaches equilibrium.[5]



Map of the world showing where earthquakes have occurred most commonly during recorded history. It follows somewhat the location of pre-Flood seas.

Back to our hot-water-bottle illustration: when the crust of the earth is pushed down in these various places, pressure is built up in other areas of the world by the partly molten mass beneath. Then, wherever there is a weak place in the earth's crust, changes are likely to occur. They may result in a fault and cause an earthquake; they may cause the uplift of a mountain range, a lava flow, or another form of volcanic action.

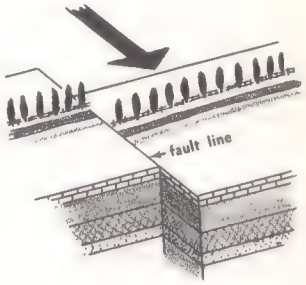
In some places where the hot magma from the earth's mantle has come close to the surface, as in a volcanic area, water may seep down to it and be ejected as a blast of steam and spray in showy geysers such as Old Faithful in Yellowstone National Park. There may also be hot pools of water or boiling mud pots that, though less spectacular, arise from the same source. Hot springs heated by the same big furnace inside the earth are common in many parts of the world. In countries such as Iceland, Japan, and New Zealand the hot water is piped for heating and laundry purposes.[6] In Italy it is harnessed for electrical power.

Hot geysers, such as Old Faithful and others, indicate that the hot magma of the earth's interior is near the surface in places.

Sometimes the internal pressure in the earth is such that a crack or fault line many miles in length forms in the earth's surface. The earth may slip sideways, drop, or rise along these cracks. The one that formed in North Yellowstone in 1955 is plainly visible and nearly broke the dam on Hebgen Lake.

The San Francisco earthquake of 1906 was caused by a side slip along the San Andreas fault line, one of the longest in the world. Near Tomales Bay there was an offset of 21 feet; elsewhere along the line it was 15 feet.[7] This meant that roads, fences, and lines of trees no longer ran straight, but had 15-foot jogs in them. Creeks were diverted along the crack for some distance and then came out to run in new channels. More recent shifts along this same fault line have caused other earthquakes, but none as severe as the one in 1906. More are predicted for the future, because there are indications of pressures building up.

The earthquake in the Mississippi valley was caused by faults of some kind. But it was not a typical earthquake, nor was it in a typical area. Cliffs appeared that suggested a fault line cutting across the country; there were also ridges and domes. A large low area was formed that now holds Reelfoot Lake, Tennessee. The area still contains many dead cypress trees that drowned when it was flooded.



The earth may slip sideways at a fault line, leaving a landscape that does not quite match.

Much greater shifts have occurred in the past where one

side of a fault has been dramatically raised and the other dropped. Whole mountain chains were thus formed, leaving a jagged multiple break that shows up as a saw-tooth range. The strata of sedimentary rock usually indicates plainly that the mountains have been lifted up. The Sierra Nevadas, of California, the Tetons, facing Jackson Hole, and a big part of the Rockies were formed this way. Mount Rundle, in Canada, is a typical example of what a fault mountain looks like.

[1] *The Reader's Digest.* 94:564, April, 1969. Pp. 110-114.
[2] Oliver Wendell Holmes. "The Wonderful One-Hoss Shay."
[3] Life Nature Library. 1962. *Earth.* Time—Life Books, New York. P. 53.
[4] *Science News Letter,* Oct. 9, 1969.
[5] William C. Putnam. 1964. *Geology.* P. 367. Life Nature Library. 1962. *Earth.* P. 87.
Carl O. Dunbar. 1960. *Historical Geology.* John Wiley & Sons, Inc., New York, N.Y. P. 396.
[6] Life Nature Library. 1962. *Mountains.* P. 62.
[7] Putnam. *Op. cit.* P. 205. Life Nature Library. 1962. *Mountains.* P. 37.

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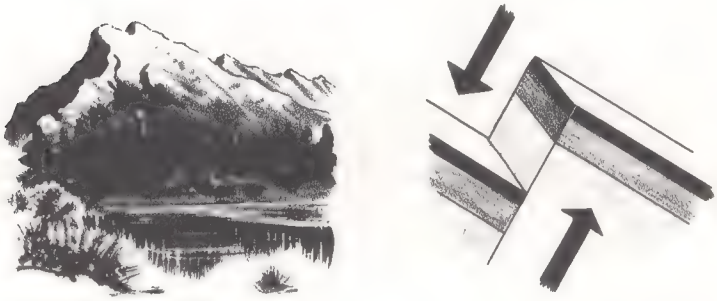


By a vertical slip of the crust at a fault line, a fault mountain, such as Mount Rundle, may be formed.

9

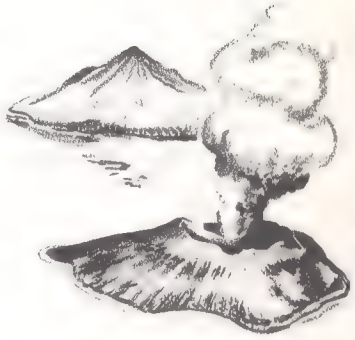
Fire Inside

IN THE SUNDA STRAITS separating Java and Sumatra stood a small island named Krakatoa. Its central peak was a volcano that smoked occasionally and had begun to rumble ominously. Then, on August 27, 1883, the crew of a British ship ten miles south of the island heard and saw it explode with a roar that was reported to have been heard 3,000 miles away. The mountain disappeared in a cloud of black smoke that was constantly shot through by flashes of lightning. Large quantities of ash and rock came down into the surrounding waters and onto the nearby land. The ash blanketed a 300,000-square-mile area, and rafts of pumice floated over much of the Indian Ocean.[1]

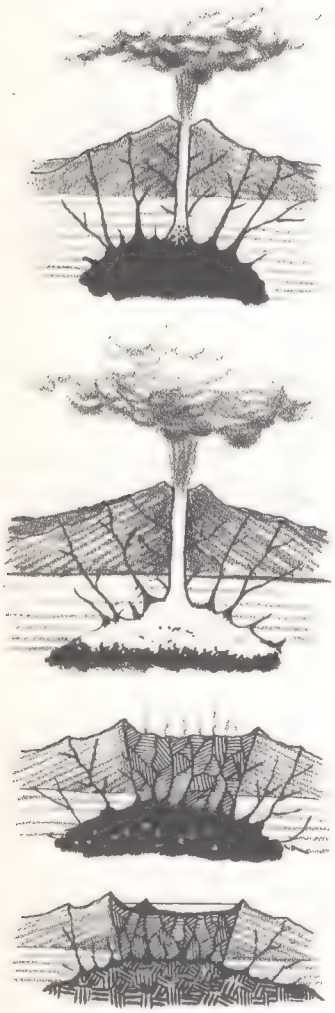
The ash was hurled 50 miles into the upper atmosphere, where it was caught by the jet stream. This powerful wind carried it around the world in 13 days, producing spectacular sunsets and for two or three years reducing the average temperature of the world by several degrees.

The explosion of Krakatoa started one of the most destructive sea waves ever recorded. It spread in ever-widening circles that surged over the coasts of Java, Sumatra, and other islands, with crests 120 feet high.[2] On these densely populated islands 30,000 to 40,000 people lost their lives. Such waves travel at speeds of 200-400 miles per hour; this one reached as far as San Francisco, 10,000 miles distant.

When eventually the fireworks had died down observers found that instead of a mountain at Krakatoa there was now a large hole. Its bottom was nearly a thousand feet below the water; three tiny islets around its rim were all of the former island that projected above the water. Because some volcanic activity still continued in the area, a new cone appeared above water in 1927 and gradually grew into another island.



Two small cinder cones were all that was left of the volcanic island of Krakatoa after it erupted.



Four stages of a volcanic eruption showing the first explosion, the blowing out of ash, the collapse into the caldera, and the final cooling with the usual lake in the crater.

At the time, it was thought that the volcano had blown its top and tossed it into the sea somewhere, leaving the big hole where it had been. More recent studies into the workings of volcanoes have now led scientists to believe otherwise. They now think that the magma, or molten rock inside a crater, becomes all puffed up when a volcano explodes. As corn that is heated inside its tough shell puffs up and pops when the pressure is suddenly released by the bursting shell, so this molten rock, heated under the pressure inside the volcano, froths and puffs up when the pressure is suddenly released by the explosion. This puffed-up rock is so full of sealed-in gases that it is light enough to float on water. It is called pumice and is used as an abrasive because of its fine, glassy, sharp-edged cell structure.

In addition to this pumice at Krakatoa there was a lot of fine ash, really volcanic dust, a natural by-product of the explosion and frothing. Few big boulders were found on nearby islands or shores, indicating the disintegration was other than just a blowing apart. The ash and pumice continued to erupt from below through the empty chamber till only the rimmed *caldera* remained.

Major volcanic activity on earth probably began during the Flood (though there seems to be some evidence of it even before that) and has continued to this day. Throughout the world there are many old volcanoes where the entire mountain of ash has been eroded away and only the plug and a few remaining dikes remain. These may have been formed and eroded during the Flood. Others were partially eroded during the post-Flood run-offs of water. There was probably a time shortly after the Flood when volcanic activity was exceptionally high. Since then it has gradually slowed down, but even at the present time there are approximately 400 active volcanoes scattered over the earth.

Volcanic activity does not occur just anywhere, but along the lines of stress in the earth's surface.

Volcanoes are not situated at random, but in what are called rings of fire. One of these giant rings follows the shores of a number of the continents that bound the Pacific Ocean. Volcanoes are also found along deep ocean trenches or rifts, faults, or fractures in the earth's crust—often in graceful bows like strings of pearls. In these same areas occur other crustal disturbances such as earthquakes. Phenomena like these indicate terrific strains in the earth's crust.

It may be that as the Americas slipped westward (if indeed they did so) they caused some of these stresses. Some believe that as the continents were pushed westward by the welling up of lava in the mid-Atlantic ridge the edge of the continents may have crumpled on the western side to form the Rockies and the Andes.

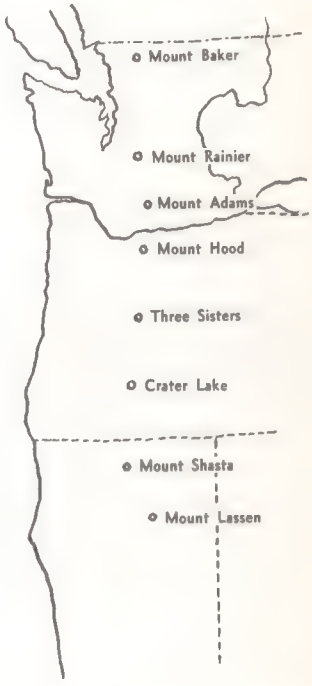
Crater Lake is what remains of the once-great mountain that geologists call Mount Mazama. Its story is similar to that of Krakatoa except that it happened before recorded history. After the volcano exploded it continued to spout ash and broken rock till what was left of the mountain dropped into the empty magma chamber below and left an immense caldera that filled with water, now called Crater Lake.

In the same chain with it is Mount Lassen, the most recently active volcano in the contiguous United States. There are other active ones in Mexico, including Ixtaccihautl and Paricutin. North of Mount Lassen, in the same series as Crater Lake, are a number of large extinct cones: Mounts Adams, St. Helens, Rainier, Baker, and also many smaller ones. In British Columbia and Alaska there are a large number of extinct and live volcanoes; the line extends all the way out through the Aleutians to Japan. Mount Fuji is a well-known and typical ash cone. Kilimanjaro in Africa and Vesuvius and Etna in Italy are other famous volcanic peaks.

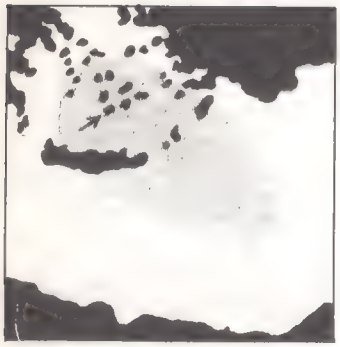
The Krakatoa explosion seems to have been an outstanding event with far-reaching influences on the world. The Mount Mazama explosion was apparently still greater in extent; then what must have been the influence of the one that took place on the island of Santorin in the Aegean Sea between 1400 and 1500 B.C.?

Archeologists, seismologists, and historians in studying this cataclysmic event that destroyed the Minoan civilization (one of the most advanced in the world at that time) have unearthed a number of interesting facts about it. Whereas Krakatoa spread ash one foot thick on the surrounding area, the ash from the Santorin volcano is 100 feet thick. The crests

Mount Mazama is the name given to the former volcano in Oregon that left what is now known as Crater Lake.



Along the Western United States there is a row of high mountains that were at one time all live volcanoes.



When the great Santorin eruption took place in the Mediterranean in prehistoric times the ash was deposited over 80,000 square miles of the Aegean Sea.

of the tidal waves from Krakatoa reached 120 feet. These were estimated to be a mile high at the vortex, and 100 feet high at Crete, a hundred miles away. They were strong enough to destroy the harbor of Ugarit, in Syria, 640 miles away.

The ash covered most of the islands on which the Minoans lived, and destroyed the people, but it missed the western end of Crete, and to that area the survivors fled. From there many went to Greece, where in time they helped develop the well-known Greek civilization among a people who were at that time quite barbaric.

When Pliny traveled to Egypt, he was told by the priests the story of the destruction of the civilization of the island of Atlantis and of its disappearance into the sea. Pliny recorded this tale, and scholars have long wondered how much truth there was in it. Now they link it with the explosion that took place in the Aegean at about that time. Some have also attempted to link the Santorin eruption with the plagues of Egypt and the crossing of the Red Sea by the children of Israel, all of which took place about this time.[3]

A number of volcanic cones have formed in modern times. They have been closely observed, studied, and photographed in all stages of development. Paricutin grew up as a small cinder cone in 1943 in a Mexican farmer's cornfield. It continued spouting ash and cinders until it built up a large cone, buried two nearby villages, and devastated the whole countryside with a fall of ashes. Still more recently a volcano has built up the island of Surtsey in the ocean south of Iceland.

The Hawaiian shield volcanoes, by pouring out lava, have built up from the ocean floor some of the highest mountains in the world.

Not all volcanoes are explosive. Mauna Loa and Kilauea on the island of Hawaii are called shield volcanoes. Lava flowing out of their craters and down their slopes has built a wide, solid cone of great extent that spreads far out under the sea and altogether forms one of the highest mountains in the world.

Mountains that are built up of ash and cinders form much steeper cones than do the shield type, but they are not nearly as durable. Craters often emit both ash and lava flows. In addition to the ash, lava, cinders, broken rock, and pumice that come out of volcanoes, there is also a substance that is even more deadly, as revealed by recent studies. Excavations of the buried cities of Pompeii and Herculaneum, in Italy, show that many of the people seemed to have died suddenly right where they were and then were buried by ash. From the following it may be seen that it was not just faithfulness to

duty that made the Roman sentry stay at his post in Pompeii till the ashes buried him.

Mount Pelee, on the little island of Martinique, in the West Indies, was supposed to be a dead volcano. The beautiful Lake of Palms rested in its crater. Then, in 1902, after warning rumbles, a spouting of ash, and some flows of lava from cracks in its side, it erupted and destroyed the city of St. Pierre, which nestled at its base. The city was crowded with farmers from the countryside who had fled from the lava and ash. All the 25,000 people in it were killed except one—a prisoner in a dungeon.

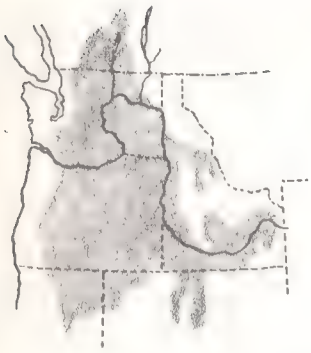
Observers on ships in the harbor (the few that escaped) saw a rolling, tumbling cloud sweep down from a vent on the slope of the mountain and engulf the city. This cloud, we know now, contained superheated steam at 1,500 degrees Fahrenheit temperature, with tons of pulverized, incandescent rock suspended in it. Added to this there probably were two deadly gases, carbon monoxide and hydrogen sulfide. People who came in contact with this cloud died instantly. It is a wonder that even one person remained alive in the city. This same process could also have taken place in the burial of Pompeii and Herculaneum.

Observers from ships fleeing the harbor saw a rolling cloud come down the mountain into the city.

Imagine a flow of lava coming out of a 15-mile-long fissure in the earth, running down a slope, and pouring into the canyon of a river. It completely fills it, as well as a lake that lies in the way. Two major torrents 40 and 50 miles long and an average of 100 feet deep, each advancing on a front 12 to 15 miles wide, cover and burn all in their paths! This is what happened in Iceland in the years 1783 to 1785. It was the greatest catastrophe in the recorded history of the island. Rivers were blocked and diverted. Ice and snow melted in enormous quantities, causing floods that destroyed farm lands. Twenty villages were covered by lava, and others were swept away by the floods. Twenty per cent of the people of Iceland died; 80 per cent of the sheep, 75 per cent of the horses, and 50 per cent of the cattle were destroyed.[4]

The erupting lava generated a dust cloud that obstructed the rays of the sun over most of the North Atlantic area. A constant dry fog, what we now call smog, covered it and a large part of North America, as well. The year 1783 was referred to as the "year without a summer." Crops failed in Scotland, and were greatly reduced in most of Europe. The ground froze early, the first snow stayed, and the winter was one of the most severe in history.

Giant lava flows pouring across Iceland in 1783 caused the greatest catastrophe in the island's history.



In the Columbia River area in prehistoric days lava flows took place that covered an area nearly 1,000 times as large as did the flow in Iceland.

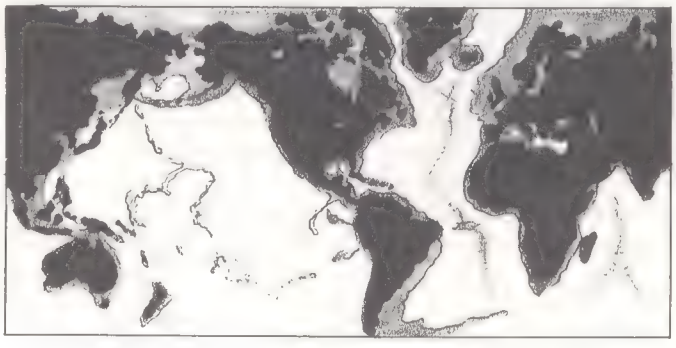
This is not the only large lava flow that has taken place on earth. The flow in Iceland is estimated to have covered about 220 square miles. In eastern Washington, Oregon, and southern Idaho lies the Columbia Lava Plateau, which covers 200,000 square miles. There are also large lava fields in the Deccan Plateau in India, near the mouth of the Paraná River in South America, and in a number of other locations around the world.

This lava that comes out of the earth either from cracks or from volcanoes is molten magma from the mantle of the earth. It has oozed out through the weak places of the earth's crust, because of the pressures of the heavy masses of continents and their mountain ranges. Lava is usually a uniformly blackish rock that breaks into squared chunks. In places it may appear reddish brown, depending on iron content and weathering.

The appearance of rock from the earth's mantle can vary greatly. The usual form is the basalt just described, but when cooled quickly it forms obsidian, a fine-grained natural glass. Cooled not quite so rapidly, but usually under water, it may form large six-sided columns set tightly together. Such columns are seen in the Giant's Causeway in Ireland, in roadcuts in northern Washington, in the Devil's Postpile in California, and in other places. When cooled normally in the air it not only forms basalt but also may form rhyolite, andesite, diorite, or scoria. When cooled very slowly in the earth it forms the coarse crystals of granite. This granite may later be pushed up from below into mountains, or it may be stripped bare of the covering earth and gravel and be exposed as granite outcroppings such as we see in the Canadian Shield.

When lava cools quickly under water it may form large six-sided crystals, such as are seen at the Devil's Postpile, in California.

The story is told of a northern Indian who was taken by a wealthy lumberman back to civilization with him. When the



The shaded areas show submerged portions of the continents that were once dry land.

lumberman flipped a switch in the hotel and a bright light appeared, the Indian was astounded and wanted to know "What make it go?" The lumberman unscrewed the bulb and let the Indian put his finger in the socket. After he had recovered from the shock he exclaimed, "Ugh, fire inside!"

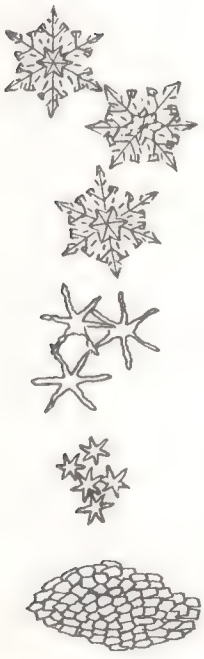
Later the Indian rode in an elevator and was frightened at the speed. The explanation of "fire inside" again answered the question, "What make it go?" When they rode in an automobile and sped past houses and trees, even though no dogs or horses were pulling it, the answer again was "fire inside." In this old world of ours there are many things that can be explained by "fire inside."

[1] *Nature Magazine*. March, 1946. William C. Putnam. 1964. *Geology*. Pp. 66, 67.
[2] ———. *Ibid*. P. 66.
[3] *The Reader's Digest*. 92:547, November, 1967. Pp. 123-127.
[4] Putnam. *Op. cit*. Pp. 83-85.

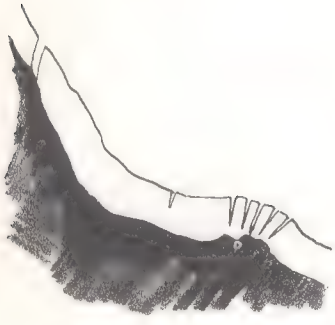
For Further Reading

(Refer to the same sources as listed for Chapter 8.)

When Mount Pelee erupted in 1902 it destroyed the city of St. Pierre at its base.



As snow falls on a glacier and accumulates, the flakes melt and recrystallize into granular ice. This packs into the solid blue ice of which the main body is formed.



As a glacier bends to crawl over a bump, crevasses appear in its surface.

10

The Age of Ice

SLOWLY, LIKE "the mills of God," a glacier grinds its way down a mountain valley. As it bends to go over a hump large transverse cracks called crevasses appear in its surface. The central part of the glacier may move twice as fast as the sides, and other diagonal cracks indicate this. The surface striations appear similar to what we see in a mud flow. The whole glacier may move less than ten inches a day, as some do in Switzerland, or it may move as much as 80 feet in a day, as some do in Greenland. How can ice flow? you wonder. It moves by a combination of melting and freezing, by crystalline adjustments, by slippage, and by shearing and crushing along its path.

Glaciers grow by the accumulation of snow at their sources. As this snow piles up, the flakes melt and recrystallize into granular ice that packs under pressure into the solid blue ice of which most of the glacier is composed. Its movement is basically caused by gravity. The water, though frozen, still seeks to find its lowest level, and its great weight relentlessly drags it down in spite of obstacles.

Coming down from the mountain at such a steady rate, one might expect the glaciers to travel far down into the valleys and overflow villages and towns. Actually in the typical mountain glacier there is a delicate balance of climatic conditions that keeps the toe of the ice boot more or less stationary in spite of the constant movement. The temperature at that level melts the ice about as fast as it arrives, faster in summer and slower in winter. When the average temperature over several years is colder than usual the glaciers come down lower; when the average is warmer they recede. Rapidly moving glaciers such as are found in Greenland flow from the interior down to the sea and break up.

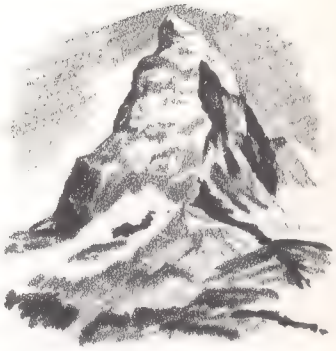
What happens when glaciers move? A number of things occur. At the upper end the ice is frozen to the rock of the mountain; as it slips away it plucks out chunks of rock and takes them along, sculpturing the mountain. When glaciers form all around a high mountain they can carve it into a pinnacle shape exemplified by the Matterhorn in Switzerland, or Mount Assiniboine in the Canadian Rockies.

As the stream of ice moves down between the mountains and gouges out the sides, rocks and gravel roll down on top of it and are carried along to be deposited lower in piles called lateral moraines. When two glaciers meet from confluent valleys, two of the side moraines come together to form a central row of rock and debris. This is deposited at the toe as a terminal moraine.

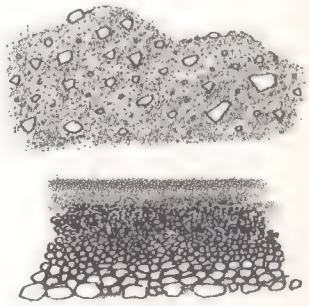
In addition to this, as the glacier flows downhill, its toe constantly pushes a mass of rocks and gravel before it. When the glacier recedes, this piled-up "till" remains where it was dumped. A glacier will usually grow and recede many times through the years and may leave many such piles of unstratified drift. Lakes form behind these natural dams and grow in size from the meltwater of the glacier until they cut through the mass and partially empty out.

When rushing water moves rock and gravel, and deposits it in a valley lower down, it always sorts it to some degree. As the movement of the water slows, the larger rocks settle first, then the smaller, until at the top there is a layer of fine silt. In this way layers form every time a stream is in flood. On the other hand, material moved by glaciers is always unsorted. Big rocks are mixed with little rocks and sand and gravel. This characteristic is easily seen in road cuts or places where streams have cut through glacial till. Furthermore, while the masses left by glaciers are jumbled and hummocky, valley fill deposited by water lies in level plains. Erosion by streams may cut the plain up considerably, but the level tops of the plains are usually still visible.

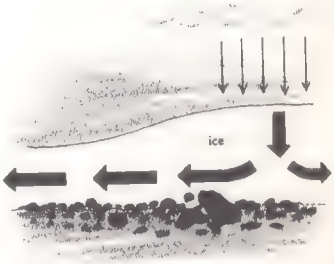
Continental glaciers vary from mountain glaciers in some respects. Instead of flowing slowly downhill, they move out from a center. The weight of the mass of snow and ice that accumulates where the glacier begins develops pressure at the bottom. To relieve this pressure the ice at the bottom can move only to the outer edge. As the ice continues to accumulate and the glacier grows, the margin continues to move outward and to push rocks, gravel, and earth ahead of it just as does a mountain glacier.



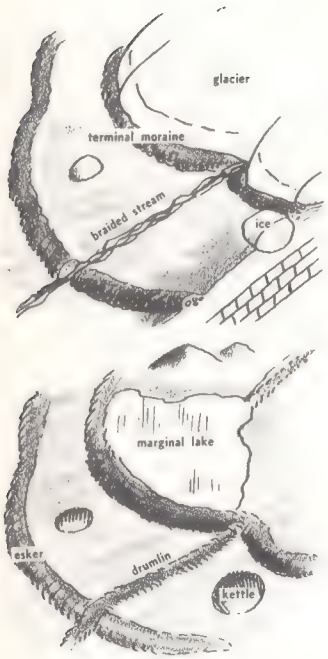
The Matterhorn is typical of a mountain that has been sculptured by ice flowing down its sides.



Gravel in formations left by glaciers is unsorted, while that left by floods is sorted—large rocks settle first, fine silt on top.



A continental glacier does not flow downhill, but moves from the center outward as the pressure increases from above.



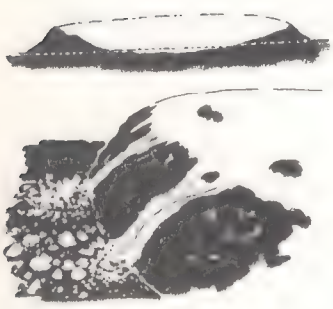
A glacier leaves characteristic features that let us know just how far it has gone.

The whole mass does not move away, for the center may be lower than the outer edges. In spite of this, the glacier can, by the movement of its marginal foot, in time carry or push rocks and soil hundreds of miles from their place of origin. Therefore continental glaciers can also leave terminal moraines, drumlins, eskers, kettles, ice marginal lakes, and other features connected with the work of moving ice.

By these typical signs geologists can tell just how far a prehistoric glacier progressed, where it receded, and where it re-advanced. From such evidence they have mapped the areas covered by continental glaciers of the past and have also determined their sources. Scratches on boulders tell them the direction the ice traveled at that particular place. They know that Northern Europe was at one time covered by ice, but Southern Europe was not.

The British Isles were entirely covered except for the southwestern portion. Most of Russia and part of Siberia was covered, but certain portions were bare of ice. In New England the ice was deep enough to cover Mount Washington, as well as the Catskills and the Adirondacks. A continental glacier passing over a mountain rounds the top and plucks the rocks from the face it is leaving.

Some have maintained that ice could not pile up as deep as it would have to in a continental glacier, that the pressure from the weight of it would melt the ice at the bottom. While this seems logical, there must be reasons to the contrary, for there are continental glaciers today in Greenland and in Antarctica. The latter, with a 5,250,000-square-mile area, is every bit as large as were some of the prehistoric ones.



The continental glacier on Greenland is nearly two miles deep in places. As the Greenland ice flows down between the mountains to the sea it breaks off into icebergs that float away and melt in the ocean.

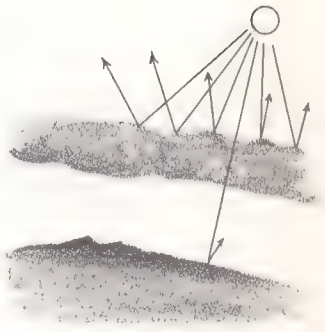
In Greenland mountain chains around the margin of the island contain a large glacier that averages 3,250 feet thick and is in places as much as two miles deep. The weight of this mass of ice has apparently lowered the interior of the island, for a large part of the earth is below sea level. The ice piles up in the interior and pours out between the mountains into the ocean, "calving" icebergs that slowly melt as they float out to sea.

It is not really improbable that continental glaciers should have existed in the past where there are none today. According to figures produced by William J. Humphrey, professor of meteorological physics, three or four times the number of volcanoes now active, by blotting out the sun's heat from the earth, could reduce the mean temperature of the atmosphere sufficiently to bring on another ice age.[1]

A number of other reasons have been advanced to account

for the drop in temperature that could have brought on an ice age. Some thought it might be related to a shift in the earth's axis, or a shifting of the continents to a more northerly location. Though both of these may have happened, most of the evidence indicates that increased glaciation took place in all parts of the world at the same time and that it came after either of the above phenomena might have happened. The continents seem to have been essentially in their present shape at the time of the continental glaciers.

More probable causes relate to radiation of heat from the sun. The amount of heat derived from the sun may have varied because of sun spots, for example, or the amount of heat reaching the earth may have fluctuated because of cloud cover, smoke, or dust particles in the earth's atmosphere. Or a combination of several such factors could have been at work.



Clouds of dust in the air reflect much of the sun's heat, thus keeping the surface of the earth cool.

There is reason to believe that the earth's temperature may have been markedly affected by clouds of dust in the air from volcanic activity. If the relatively small lava flows in Iceland, mentioned earlier, had so drastic an influence on the climate of Northern Europe as they did, what might we expect from the many layers of lava that covered the expanse of the Columbia Plateau to depths of a mile in places? Or the activity that occurred in the Deccan Plateau in India, or that in Argentina? Not that lava flows create so much dust as do the volcanoes in surrounding areas. But they do create a lot of smoke as they burn everything before them, and they do raise great clouds of vapor as they fill bodies of water and as they send rain and snow back up into the air to fall on the snow fields of continental glaciers.

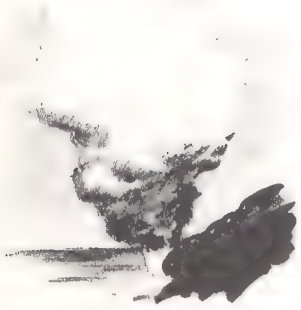
If the dust thrown up into the stratosphere by the explosion of one volcano such as Krakatoa could affect the climate of the earth and remain an influence on it for three years, then surely the vast volcanic activity of the past could easily have lowered the average temperature of the earth the few degrees needed to bring on an ice age.

If long, cold winters were the only requirement for continental glaciers, there should be ice over most of the arctic now. Actually the winters are cold enough, but summer weather is much more critical. If the ice melts each summer it cannot accumulate very fast, but if there are a few years with cold summers a large field of ice can soon be built. It would of course take considerable time for it to become a mile deep, as it apparently must have been.

If the dot near the middle represented the area of the lava flow in Iceland the outlined area around it could represent that of the Columbia Plateau.

One other important requirement is abundant moisture.

There must be enormous precipitation of snow to build up vast ice fields. As the earth slowly emerged from the waters of the Flood large lakes were impounded behind heaped-up barriers that have since been cut through. These could have provided part of the moisture needed to form snow clouds. The oceans surrounding the glaciated areas no doubt supplied the rest. The cool temperature of the beginning glaciers would tend to precipitate the moisture in the cloud-laden winds blowing over them.



Imagine the clouds of steam formed when red-hot lava flowed into the water from thousands of sea mounts, guyots, and volcanoes near the ocean.

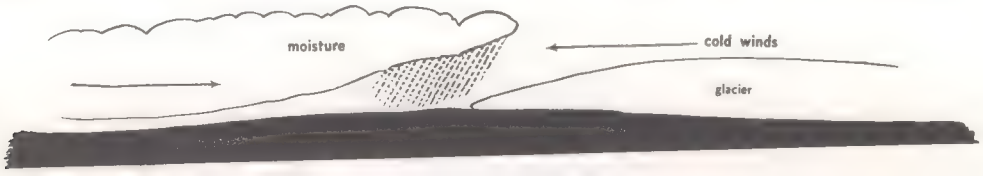
Early Indian legends say that the clouds were formed by fire flowing out of the mountains into the sea. Perhaps they are right to an extent. We can imagine the clouds of steam that would be formed as lava flowed red hot into the water from the many sea mounts, volcanic islands, and the volcanoes near the sea. This would certainly increase the water vapor in the air and add to the amount that could fall on the glaciers.

In localities where temperature and moisture conditions were ideal for it the heavy snowfalls would accumulate year after year and pile up on the permafrost. Such conditions would tend to perpetuate themselves and form a cycle. Because of the large amount of snow and ice present, the region around a growing ice field would be colder than usual, clouds would lose their moisture, and the circle of ice would continually grow larger and larger. Cold winds blowing outward from the ice would meet warmer, moisture-laden air at the edges and start new snowstorms to pile up snow on the fields around, thus increasing the size still more.

Heavy snowfalls up to 75 feet deep have been recorded on Mount Rainier.

There are records of exceptionally heavy snowfalls in recent, comparatively normal, times. During the winter of 1955-1956 there was a fall of more than 75 feet of snow on Mount Rainier in Washington. In 1921 six and one-half feet of snow fell during one day in Colorado.[2] How heavy the snowfalls were in the extraordinary times that produced the continental ice fields we do not know, but they could have been even greater.

The mass of ice and snow in prehistoric times evidently increased until it reached its maximum. Then if the volcanic activity on the earth in general slowed down and the earth became warmer and drier, the cycle would break and the process would begin to reverse itself. It might recede for a while and then come back again or it might go back permanently and the age of ice would end. Once the reversal began, it could go rapidly. The hot summer sun shining from a clear sky can melt snow and ice very quickly, as those who have



Cold winds blowing from ice fields cause snowstorms as they meet warmer moisture-laden clouds.

lived in the north can verify. What floods there must have been then! It may be that many deep river channels were cut still deeper, filling valleys with sand and gravel.

We are told that there were three large sheets of ice in North America in addition to the one in Greenland. The largest one was the Keewatin. It spread out from a center in the Northwest Territories west of Hudson Bay, and as the snow fell and the summers forgot to come it grew until it covered most of central Canada, the Hudson Bay, and the Great Lakes region, and reached cold, icy fingers far down into the area of the Midwestern States. Another glacier center lay in northern Quebec. This one spread to meet the Keewatin on the west and covered eastern Canada and New England.

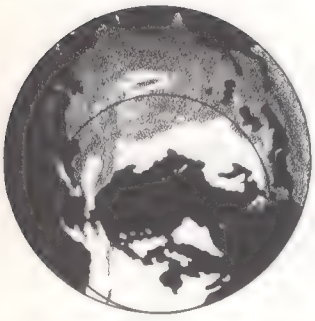
To the west in the mountains of British Columbia from Alaska to northern Washington, lay the Cordilleran ice sheet. Between this and the Keewatin there apparently existed a corridor that was open much of the time, especially during the summers. It apparently served as a migration route for men and animals going to and fro between Asia and America while the probable land bridge across the Bering Strait was open. In the Old World, portions of Siberia were bare, probably due to lack of moisture rather than any lack of cold.

During this time mountain glaciers extended much farther down the slopes than they do now. It was through the study of these glaciers in Switzerland that geologists were alerted to what had happened in far greater areas of the world. Apparently there was very little glaciation in the Southern Hemisphere at this time, in part, at least, because the southern continents do not extend as far toward the polar regions as do the northern ones.

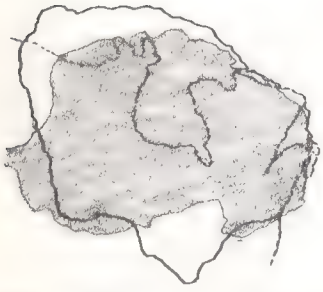
Most geologists apparently are convinced that there was not only one ice age, but four, that each one lasted for millenniums, and that there were periods of thousands of years of warm weather between the ages. The volcanic activity that, according to our theory, caused the excessive glaciation, very possibly could have fluctuated considerably, and the ice could have advanced and receded several times, but this need not have taken millions of years. Some creationist geologists believe that ice covered so much of the country only once, and that the evidence attributed to the other ages is the work of water during the Flood. There are a number of facts about prehistoric ice of which we can be fairly sure; there are also

Between the western and the eastern ice sheets a corridor remained open during much of the age of ice.

In Europe large areas were covered by glaciers, but most of Siberia was bare.



The white area on this polar map indicates how far the ice extended during the time of the continental glaciers.



The Antarctic continental glacier today is larger than most of the prehistoric ones were.

many theories that are entirely in the realm of speculation. We must be careful not to accept as fact all the statements made about it.

We must bear in mind that there need be no millions of years involved in the ice age. All the phenomena connected with the ice could have taken place in a relatively short time. We need not think that it took eons for the ice of the glaciers to accumulate when each winter large portions of the earth are covered in a few months. The power and the material is there. All that is needed to bring about vast changes in a short time is for the balance of nature to be disturbed just a little. Nor would ages be required for the ice to disappear. Once the status quo of the earth's temperature is restored the ice would go quickly.

The formation and disappearance of the ice sheets could have taken place between the time of the Flood and the beginning of recorded history. Events in Northern Europe have been recorded only since about the time of Christ. The early people of Britain lived in very primitive circumstances in a swampy land, except for those in the southern part, which was not covered with ice. A reading of *Beowulf,* one of the earliest of Old English poems dating from around the seventh century A.D., gives one the impression that the people lived in a dim and misty land of marshes and sea monsters, only recently reclaimed from the ice age, a habitation fit only for the hardiest of men.

Gradually the climate grew warmer in the northern areas as the ice melted. Water from the melted ice caused the seas to rise again, and some of the land bridges that existed during the glacial period overflowed with water. Large portions of the Canadian Shield, around the Hudson Bay, were stripped bare of most of their earth. This earth, together with accompanying rocks that were ground up under the millstone of the ice, was deposited again farther south, where it made good farming soil: The scars of the "time of great cold" were gradually healed by Nature's productive bounty, and the world turned merrily on.

[1] Harold W. Clark. 1946. *The New Diluvialism.* Pp. 139, 140.
[2] George F. Taylor. Snow. World Book Encyclopedia (1964 ed.), Field Enterprises Educational Corporation, Chicago. Vol. 17, pp. 443, 444.

For Further Reading

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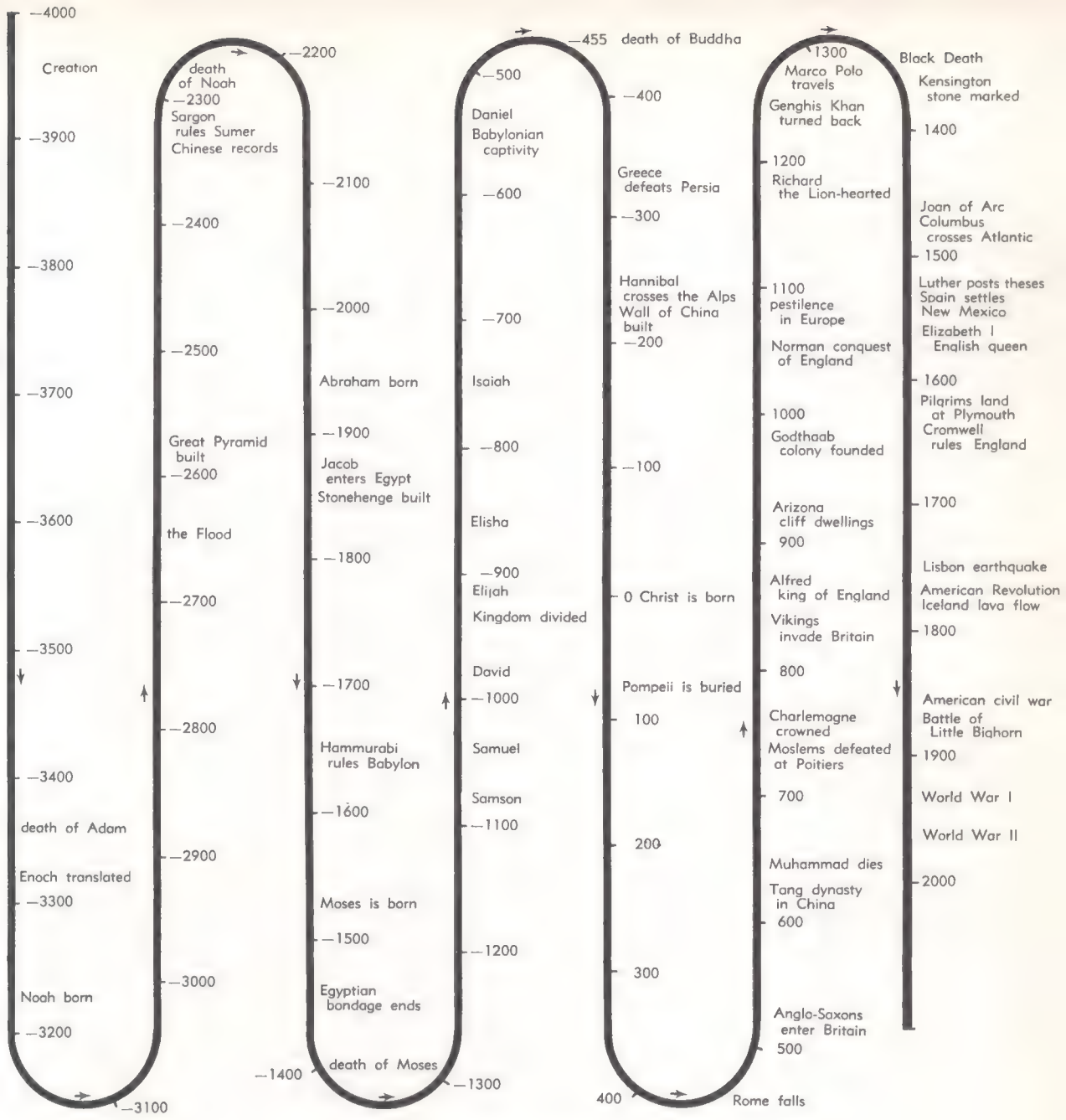


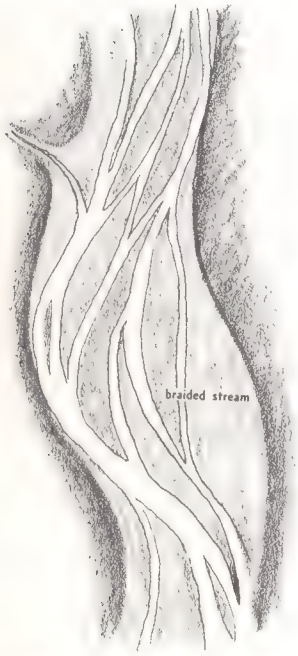
The time of important events is roughly indicated on this scale diagram to give an overview of the history of our earth. There are large sections of time when ice ages could have existed without nations in the south even being aware of them. Dates before the Flood are from Biblical chronology, those after, from *The SDA Commentary* and historical sources. The time between the two, including the dates of the Flood and of Creation, is uncertain.

11

As the World Grew Older

When ice blocked the St. Lawrence River, water from the Great Lakes flowed down the Hudson and the Mississippi to get to the ocean.

STRANGE THINGS HAPPENED during the ice age. The long fingers and pushing knuckles of ice gouged out the basins of the Great Lakes. Then when the ice left the lakes, the St. Lawrence River remained ice-blocked. Because the meltwater could not flow out that way, the lakes enlarged, draining to the south and the southeast. Lakes Superior and Michigan flowed out of their southern tips into the Mississippi River, and Lakes Erie and Ontario emptied through the Hudson River into the Atlantic. When the St. Lawrence River cleared of ice the lakes changed to their present drainage system.[1]



Glacial meltwater loaded with silt and gravel forms braided streams in level valleys.

A similar phenomenon occurred at Lake Winnepeg. Because the ice dam of the glacier prevented the water from flowing north, a large body of water—geologists now refer to it as Lake Agassiz—formed over most of southern Manitoba. It drained south through the Red River into the Mississippi. When the Keewatin ice sheet completely disappeared the lake was able to empty north again to the Hudson Bay. The Red River then reversed its present direction, flowing into Lake Winnepeg instead of out of it.

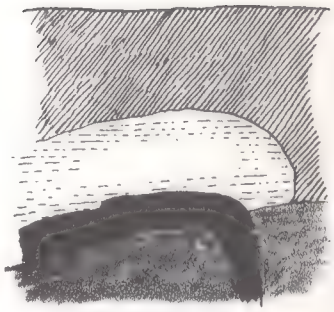
In northern Washington State the glaciers pushed the Columbia River south of its present course. It formed huge falls near the present Grand Coulee Dam. Later the river reverted to the former channel and left the falls dry with only a small lake at the bottom.

Glaciation and volcanism evidently were taking place at the same time. The lava flows of the Columbia Plateau were possibly one of the main causes of the ice age, and since they continued for a long period with many intermittent flows some of the ice flows and the eruptions in the Northwest probably took place at the same time.

Just south of the area where the continental glaciers stopped in northern Washington there is evidence of an event that has puzzled geologists. A complicated network of channels runs from the northeast to the southwest, suggesting that a mighty flood washed across the central part of the State, cutting deep gorges through the lava beds to the Columbia and out to the sea. Some have proposed that a large impounded lake in northern Idaho cut through an ice dam and flooded en masse across the lava plain.

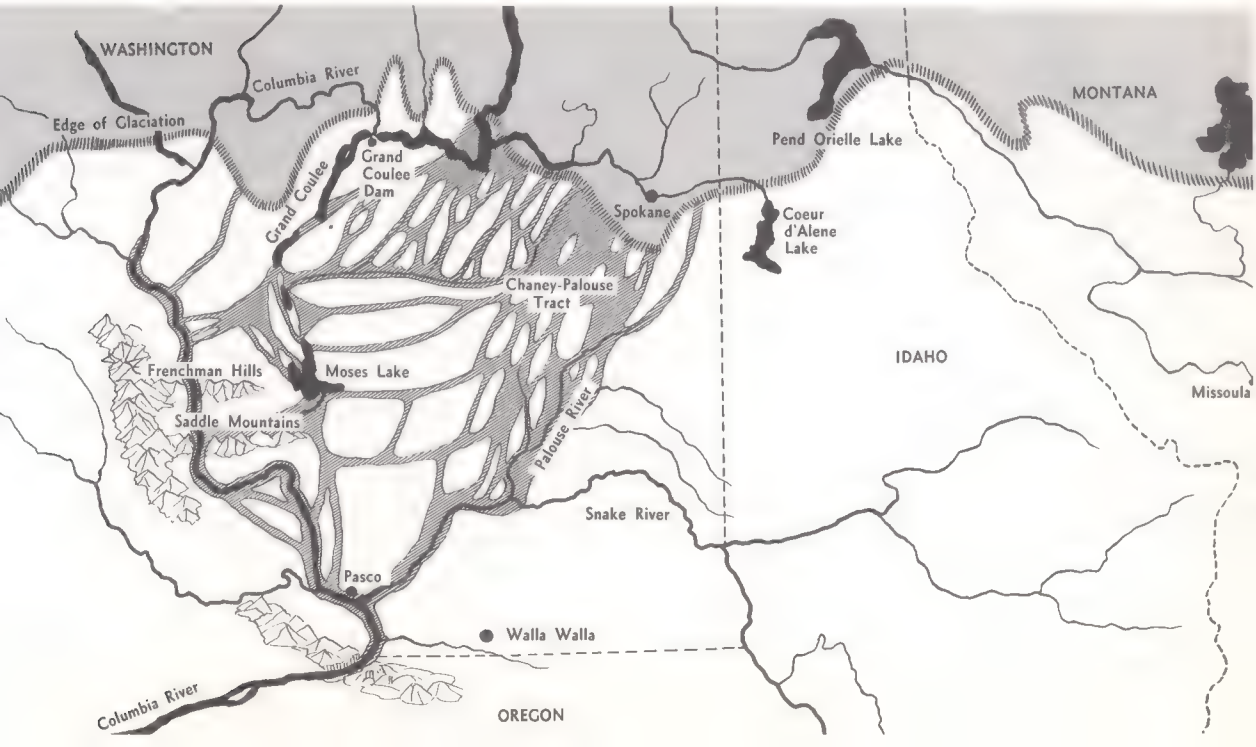
An alternative explanation may be found in Iceland, in another phenomenon closely related to this. A small continental glacier covers part of the island. Under it at several places there are cracks in the earth from which lava flows at times. This hot lava melts large volumes of the ice, and the resulting hot water collects under the ice until it bursts forth in a terrific flood called a "jokulhlaups." One of these had a volume of flow greater than that of the Amazon at its mouth. Fortunately for that small island it lasted only two days.[2]

This could have happened also in central Washington during the ice age. Indeed it might have occurred several times and in a much greater volume than in Iceland. Such floods may have cut the many channels that now cross the lava beds and also may have helped to cut the bed of the Co-



Lava coming up under a glacier can melt a large amount of ice.

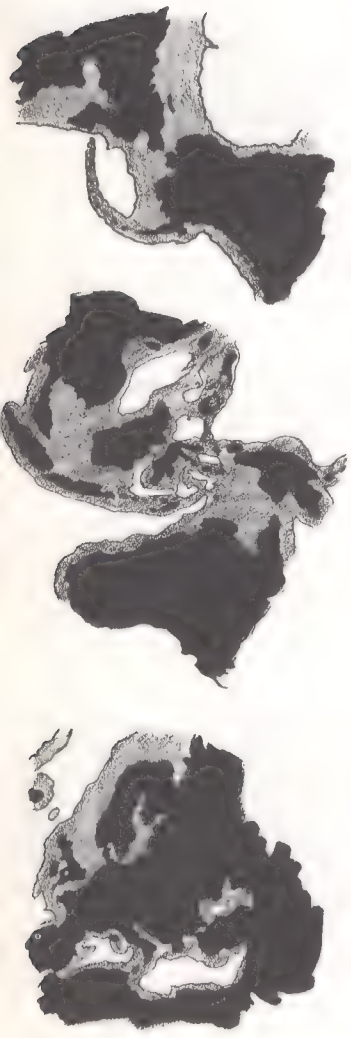
A complicated network of channels crosses the lava country of central Washington. How was it formed?



lumbia through the wall of lava at Wallula Gap.

An enormous amount of water is stored in glaciers. If all the present glacial ice were melted the oceans would rise an estimated 100-200 feet. This is enough to flood many of the big coastal cities.

The continental glaciers that covered so great a part of the Northern Hemisphere in the past held so much water that if they were restored the sea level would be lowered 300 feet or more.[3]



With the enormous amount of water frozen into ice during the time of the ice age, the level of the ocean went down, exposing continental shelves and leaving land bridges in a number of places.

There would be land bridges in many places where there are none today. The Bering Strait is only 180 feet deep—the sea bottom there would have been high and dry for men and animals to move back and forth between Asia and America. They probably could have come also via the Aleutian chain from farther south in Asia. There could have been land bridges in a number of other places—from India to Ceylon, from Australia to Tasmania and New Guinea, and through the Indonesian Archipelago to Asia. Many of the continental shelves were bare ground. The British Isles connected with the Scandinavian Peninsula and both were part of a much larger continent of Europe.[4]

There were other interesting phenomena relating to the glaciers. Today we notice that the water coming from glaciers often forms braided streams. Flowing over fairly level ground, loaded with sand and gravel sediments, these streams form many channels that keep constantly changing and running into one another. They erode first one bank and then the other. At flood time they fill the whole channel with roiled liquid that is "too thick to drink and too thin to plow."

The streams and rivers flowing from the continental glaciers acted in much the same way. They produced wide gravelly plains in valley bottoms. These valleys being blocked with terminal moraines, the current filled with stream-sorted gravel (often deposited in ridges) and with rounded rocks and silt. Then as a lake would rise over the dam and cut through, the stream would again cut a channel through the fill it had deposited and wash it farther down to be deposited in a lower valley. These streams would not only wash a channel but meander and erode a wide area and form a second valley inside the first one. At times the lay of the land was such that the stream undercut benches of fill on one side, leaving the other side of the valley to slope away into a gently rising plain.

Following the period of continental glaciers the country

where they had been was still a vast swampy wilderness of stunted vegetation. Much of it was scraped bare and had outcroppings of granite bedrock that was polished and scratched. One need only to look at a detailed map of northern Ontario, Minnesota, or the northern prairie provinces of Canada to see a typical glacial land. Myriads of lakes, streams, and swamps cover the area.

A traveler in this type of country today will see stunted willow scrub covering the plains, with here and there a clump of ragged spruces rising above a mound. Water stands everywhere, hardly flowing through the thin, black topsoil and blue clay of the level plain. Travel is almost impossible except in winter, when the ground and water are frozen. Even the rivers wander around and become lost in this land!

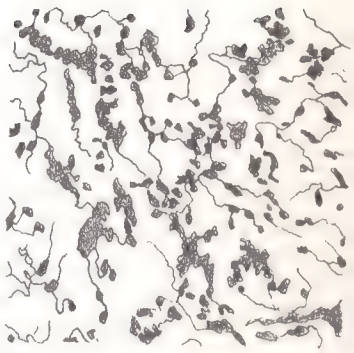
In their time schedules geologists often expect many ages to transpire before such land becomes arable, but this need not be the case. When I first visited such a wilderness in northern Saskatchewan, farmers had plowed some of the ground on the southern fringe. The soil was gray. Wheat stood yellow-green in water. Farming in such a country seemed a hopeless proposition. A friend who lived there assured me that the good farm land farther south had been the same as this when first plowed, and that this soil would soon be firm and tillable.

When I recently revisited this area I saw the truth of his prediction. Where 20 years before there had been nothing but swamp, now excellent farm land supported good crops of grain and alfalfa.

Similar conditions prevailed over much of central Saskatchewan in 1900 when my father first went there to homestead. The country abounded in sloughs; ducks nested around them by thousands, and in autumn were shot by the wagonload. The long slough grass was cut for cattle feed and thatch, and the prairie sod was plowed and put into wheat.

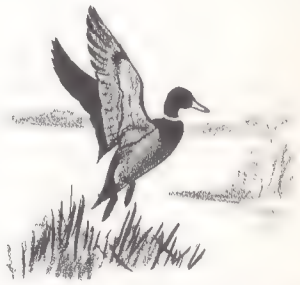
In my earliest memory of the country only the larger sloughs remained. The number of ducks had greatly diminished, and later many of the remaining sloughs dried up. Then the farmers began to realize that they had been an asset to the country, and by building dams, they restored many of these oases as farm ponds. Thus within even a few decades great changes can come about in the character of the land.

Geologists estimating the amount of time elapsed between volcanic eruptions also often allow more than need be. When the island of Krakatoa disappeared after the eruption and then reappeared as a sterile island of volcanic ash scientists

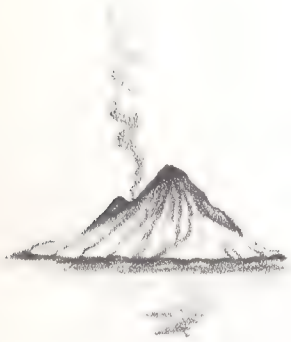


A detailed map of a portion of glaciated north country, showing the network of lakes and streams.

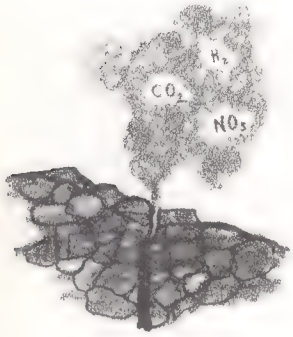
Here and there a clump of ragged black spruce rises above a mound.



Ducks nested around the sloughs by the thousands.



Geologists are inclined to be generous with the time allowed for the recovery of devastated areas. They were surprised that Krakatoa should have abundant vegetation ten years after it had been completely destroyed.



Volcanic soil is very rich, and gases coming from volcanic vents provide just what the plants need in order to grow.

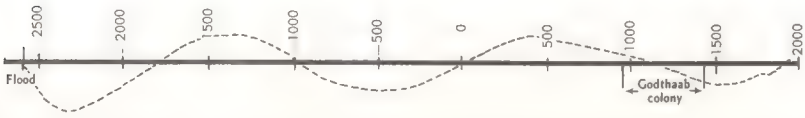
were eager to see how soon life would be restored, and they watched it closely. The results were surprising. Ferns and palms appeared in three years. In ten years there was abundant vegetation, and in 40 years the island was covered with an impenetrable jungle similar to that of surrounding islands. Insects arrived early and multiplied rapidly. Two species of land snails, besides monitor lizards, geckos, and birds, were found on this isolated island, 30 miles from the nearest land, after a period of only 25 years.[5]

The high fertility of volcanic soils encourages a rapid plant growth. It tempts people to farm closer and closer to active volcanoes, sometimes with tragic results. The Palouse hills of eastern Washington were formed of wind-blown dust of volcanic origin, and are now rich wheat- and pea-growing localities.

During eruption volcanoes release large quantities of hydrogen, nitrogen, and carbon dioxide. These all replenish the supply in the atmosphere. Plants require nitrogen, which constitutes four fifths of the gases in the air, and they also take out the carbon from the carbon dioxide and release the oxygen for animal life to breathe. Often in volcanic areas there are vents in the ground from which these gases escape into the air. All these by-products of volcanism have helped to restore the world destroyed by the Flood and to sustain the varied forms of life.

It appears from fossil evidence that the climate of the earth fluctuated for some time after the Flood, and during and after the time of the continental glaciers. The continued volcanic activity was probably responsible for this instability. There was evidently a warm period after the Flood and again after the ice age. The earth's climate slowly cooled again till about the time of Christ, when it turned warmer, reaching a peak at about A.D. 400. According to C. E. P. Brooks's *Whaling History,* the large raft of pack ice that constantly floats around the arctic seas had practically vanished by A.D. 700. Then by A.D. 1450 it reappeared and curtailed the activities of whalers of that time.[6] The chart shows that in A.D. 1300 the average temperature was below what it is today.

During the latter half of the warm spell, in A.D. 984, Norsemen established the colony of Godthaab in western Greenland. Later they even visited the coasts of New England. In the colony of a few thousand, the Norsemen kept livestock and farmed as well as fished. By A.D. 1410 the climate had become so cold that the colony could no longer be supplied



or contacted, and all the remaining settlers perished.[7]

An exceptionally cold year during this time was A.D. 1315. It was a year of great hardship in England and Scotland. Coming right after the Battle of Bannockburn, it was looked upon as a visitation of the Lord because of the arrogance of the English king.[8]

A cold rain fell most of the summer, corn and hay rotted in the fields, gray mists covered the pastures, and the cattle lowed in misery at the corral bars. Winter came early with great snowdrifts that isolated villages and caved in roofs of buildings. Livestock froze to death, and starving wolves threatened the settlements. Many people died; some migrated through the frozen land to survive in milder southern climates. Eventually the period of cold years came to an end, and in the warm summers hope revived, crops improved, and people migrated northward again.

The early Norsemen founded a colony at Godthaab, Greenland, in A.D. 984, but had to abandon it by A.D. 1410, during the cold part of the cycle.

[1] Carl O. Dunbar. 1960. *Historical Geology.* Pp. 397-401.
[2] Julian Kane. Iceland's thermal geology. *Natural History,* January, 1969, pp. 48-51.
[3] Dunbar. *Op. cit.* Pp. 395, 396.
[4] William C. Putnam. 1964. *Geology.* Pp. 357, 356.
[5] Willy Ley. 1951. *Dragons in Amber.* The Viking Press, New York. Chapter 15.
[6] Ivan T. Sanderson. 1956. *Follow the Whale.* Bramhall House, New York. P. 275.
[7] Putnam. *Op. cit.* Pp. 351, 352.
Howard LaFay. The Vikings. *National Geographic.* Vol. 137, No. 4 (April, 1970), pp. 492-540.
[8] Thomas B. Costain. 1963. *The Three Edwards.* Popular Library, New York. P. 180.

For Further Reading

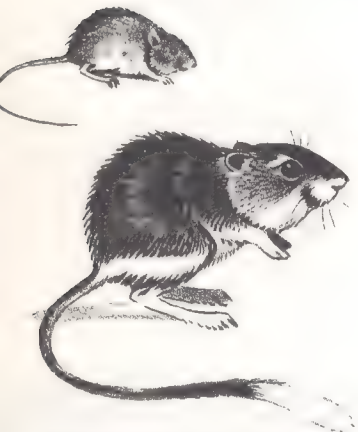
Coffin, Harold G. 1969. *Creation—Accident or Design?* Chapters 22, 23.

During the "time of great cold" some migrated south to survive in a milder climate.

The crucifixion thorn has no leaves to make shade. Thorns lose less moisture and protect the plant.

12

How Deserts Were Born



Spiny pocket mice and kangaroo rats come out after dark to hunt for seeds produced in abundance by desert plants.

The common desert pack rat gets some moisture from the fleshy cactus it eats.

THE SUN BEATS down on the hot desert sand. The temperature is 120 degrees in the shade, but there is no shade. The crucifixion thorn has no leaves to make shade. Its thorns are leaves that have been modified to lose as little water as possible. There is no water. No rain has fallen all year. When rain does come it must be quickly absorbed by large shallow networks of roots and stored for later use. Almost all plants have thorns—they need them as protection against animals. Water is the precious, life-giving liquid that must be protected and hoarded in this harsh and hostile world of the desert.

We see no birds or animals. Under the thorn bush there is a small hole in the sand, with tracks leading to it. A lizard lives there, but he will not come out till the shadows lengthen and the heat is less intense. He too must conserve moisture.

As darkness falls a spiny pocket mouse emerges from its hole and searches for seeds that may still be left from the crop produced after the last rain. All desert plants produce seeds in abundance. There must be many so that a few may be left to survive and grow. A kangaroo rat hops about looking for mesquite seeds to carry in its pouches and store in underground cellars. Desert rodents must store if they would survive. They can go without drinking water, for they manufacture it from the carbohydrates in the seeds they eat, but these they must have.

In the darkness a kit fox steps softly and listens for the sound of a kangaroo rat or a pink-footed pack rat that might make a meal for him. Bobcats too are prowling around. A badger, nose to the ground, is looking for the hole of a round-tailed ground squirrel he might dig out while the hapless animal sleeps. Overhead brown bats from a nearby cave are

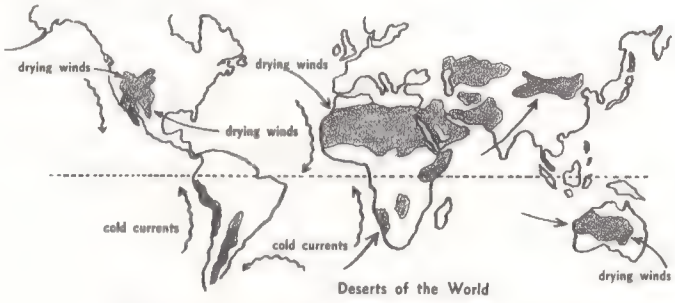
wheeling back and forth catching insects on the wing. This is life in the desert.

A desert, to qualify as such technically, should have less than ten inches of rain a year and be hot. A more temperate area with that amount of rainfall would not dry out so rapidly and could grow grass and other forage. Deserts and dry steppes amount to about one seventh of the world's land area. Of the 12 major desert areas the Sahara is the largest.

How do deserts come about? Why do they lack water? There are several reasons. In some areas of moderate rainfall, terrific heat and wind combine with loose soil conditions to make a desert of a place that would not otherwise be one. Some deserts, such as the Kalahari, Turkestan, Gobi, and the central portions of the Sahara and Australian deserts, are simply too far inland. By the time the winds from the sea reach them they have lost all their moisture.

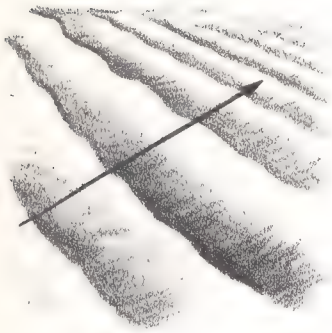
In some cases, as with the northern part of the American deserts and the eastern part of the Australian desert, mountain ranges prove a barrier. Sea winds coming over the mountains lose all their moisture as they rise to cross. When they come down on the other side they often pick up what little moisture there is, making the desert drier than ever.

The deserts of Southern North America and of South America, the western part of the Sahara, and the western desert of South Africa, are dry for another reason. The sea winds that blow over them have come from a colder region to a warmer one. Warm air can carry far more moisture than cold air. Therefore these winds have little moisture to spare and are more inclined to pick it up than let it fall as they warm up flowing over the land.



About 1/7 of the earth's surface is now classified as desert. Why do deserts form only in certain places?

The kit fox and badger prey on the desert rodents. A brown bat catches insects overhead.



When the sand is deep and the wind direction steady the dunes develop into wave patterns.

Of course, there are always vagaries of wind and weather —winds, for instance, do not always blow from the same direction. For this reason desert areas sometimes get very heavy rains. They may get their average yearly rainfall in a day or two; on the other hand they may go for years without a drop of water.

When we think of deserts we think of sand dunes, but not all deserts have sand. Even in the Sahara sand dunes cover only one tenth of the total area. Dunes sometimes blow in from ocean beaches or lake shores and make barren places that were once arable land. They can grow up to 500 and even 700 feet high; with a steady wind blowing over them they can travel at a rate of 65 feet in one summer.* The wind picks up the sand grains from the windward side, rolls them over and drops them down the steep leeward side of the dune. Oasis villages can be entirely buried by large sand dunes and then uncovered years later.

Crescent-shaped dunes form when the amount of sand is limited. They pile up on the bare gravel or hardpan when the wind blows steadily from one direction. Interestingly they point in the opposite direction from that in which the wind actually blows. Star-shaped dunes form when the wind blows from several directions. In some deserts, like the gibber plains of Australia, the sand has all been blown away and only the gravel and stones are left.

The air rises over hot deserts and forms strong updrafts. It comes down in cooler areas and sweeps in toward the desert again.

Deserts are usually areas of low pressure because the air rises when it becomes heated, causing strong updrafts that tend to carry the clouds with them. This air, of course, has to come down again, usually far away in a cooler part of the country. Air moves into the desert from the surrounding districts, making a huge convection current with the desert as its center.

Some deserts are partially man made. This is particularly true of the Middle Eastern countries. Visitors to Palestine have a difficult time regarding it as the "land flowing with milk and honey," as it is referred to in the Bible. The phrase that comes to mind more readily is "barren as the hills of Gilboa." This country at one time certainly was far more fruitful than it is now. When the 12 spies sent out by Moses returned from the Promised Land they agreed that it indeed flowed with milk and honey.

At that time the area was sparsely settled; people lived in cities and cultivated only the land near them. The hills were covered with forests in which wild creatures such as bears,

deer, and wolves lived. Lions roamed the grasslands. Sheep were kept under control by these predators, and because of this the hillsides were still covered with grass and shrubbery. The cedars of Lebanon formed large forests in the coastal mountains. Because of the ground cover, the water from the early and latter rains did not all run off, but was held to seep slowly through the ground and come out in springs that fed the streams. The water in these streams mingled with that from the snows of Mount Hermon and kept the rivers running even in the dry seasons.

The Cedars of Lebanon once formed large forests in the coastal mountains. Now only a small clump remains.

Slowly all this changed. Population increased, more land was cultivated, flocks of sheep and goats increased and kept the hillsides bare. Forests were cut down and not replaced, fires burned the forest duff down to the bare ground. Of the cedars of Lebanon only a small clump remains. The mountains are now bare of trees. When it rains, because there is nothing to hold the water, it all runs down at once, gouging out deep wadis, eroding the countryside, and washing the good soil into the lakes and surrounding seas. When the dry season comes there is no reserve of water, the creeks are dry, and the springs have ceased to flow. Fortunately many of the countries in that area are now aware of what has happened and are carrying out programs to restore the fertility of the land and to reverse the process that made it a desert.

People in America also have been guilty of producing deserts. The "dust bowl" in the West was produced when large sections of marginal land that should have remained in pasture were plowed for raising grain. Overgrazing in many of the Western mountains has encouraged erosion and flooding that contribute to desert making. Fortunately, here also people have become conscious of the hazards in some of the practices and are doing something to remedy or reduce the damage caused. The conservation picture on the whole, however, is far from bright.

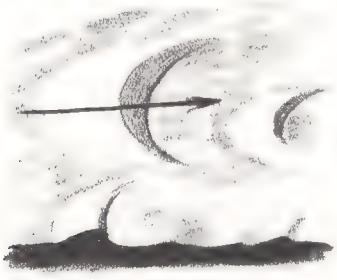
Though man has made some deserts, he has also made some rare gardens in the deserts. Soils that have known little rain are usually rich in mineral salts, since they have not been leached out as has happened in more rainy areas. For this reason when deserts are irrigated they yield bountiful crops that are exceptionally rich in minerals. Also, because the skies are sunny most of the time, the fruits are sweeter and more highly colored than in areas that are fully supplied by rain.

Soils that have known little rain are often unusually rich in minerals and produce bountiful crops when irrigated.

So, even though one may think of deserts as less than ideal

environments, when they are supplied with water they have much potential. The desert can certainly blossom as a rose, and even without water wildlife has adapted itself to live and thrive in its environment.

* Life Nature Library. 1961. *The Desert.* P. 34.



Crescent-shaped dunes form when the amount of sand is limited and the wind is steady from one direction. They point in a direction opposite to the way the wind blows.

Star-shaped dunes form when the wind varies in direction.

13

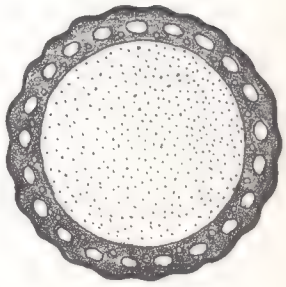
Of Oil, Coal, and Petrified Wood

IN THE PRE-FLOOD forests the plants had their heyday. Vegetation of many kinds flourished with an abundance unknown today with the exception of some of the rain forests of the tropics. The climate was ideal over much of the earth, and plants like the club mosses or horsetails, which now grow only one or two feet tall, then grew to heights of 130 feet. These trees, of course, were different from our common ones today. They had no concentric tree rings in their wood, but were fibrous like the trunks of palms.

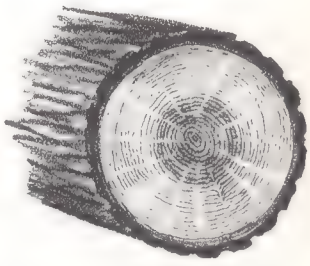
Tree rings form when the cambium layer between the bark and the wood makes its rapid growth. The period of growth in spring and summer shows large cells; then as the growth slows down, the cells become smaller till during the winter when the tree is dormant a thin line forms that marks the boundary ring. Naturally it takes seasons to make growth rings. It is not necessary to have a winter, but there must be a variation in the season—wet and dry seasons will produce growth rings.

It follows then that if there are two sets of variations in the year there could be two growth rings, and this is exactly what has happened in some places, in the Southwestern United States, for instance. This casts some doubt on the computations of the age of some of our oldest trees such as the sequoias and the bristlecone pines. There are cases on record of six growth rings on one tree for one year. On the other hand there are also times and places where there are no growth rings for several years.

Many species of trees that grew before the Flood do not exist today, but there are others that are still common. Among those that grew in the low swampy ground were tree ferns, seed ferns, cycads, and cordiates. Of these only the tree ferns



Many of the trees of the pre-Flood forests were giant club mosses. They were fibrous in cross section like the trunks of palms.



Other woody trees have concentric growth rings, each of which usually indicates one season's growth.

Several species of ginkgos grew before the Flood. Now we have only one species, a native of China.

and cycads still exist in some of our tropical forests.

The ginkgo, or maidenhair, is a peculiar conifer with radial leaves instead of needle-like leaves. Several species of this tree were common over a large part of the earth, including Greenland, before the Flood. Today there is only one species left. Native to China, it has been planted throughout the world and now grows in many American parks.

Another common tree of that time was one similar to the Norfolk Island pine that grows in the South Pacific. There was also a type of redwood that was believed to be extinct. It was a great surprise to paleobotanists when the dawn redwood, as they called it, was discovered still growing in Southern China. It is easier to believe that it survived the Flood than that it survived extinction for millions of years.

Information on many of these apparently pre-Flood trees comes to us from fossils found in coal and as petrified trees or leaf prints in shale. We know from microscopic examination that coal had been formed from buried trees.

Peat is formed in bogs when successive generations of plants die under water. Could our vast coal deposits have been formed in this way?

Peat now forms in bogs when successive generations of plant life die and are buried under water that excludes air. There is not much pressure exerted on it. Since it is soaked with water all the time it does not compress enough to form coal, even after long accumulation. When the water is drained off it can be dug up, dried, and burned for fuel.

From five to fifteen feet of vegetation is necessary to make one foot of coal.[1] Some coal seams in China, for instance, are 400 feet thick. It is difficult to imagine a bog or forest accumulating to a depth of 8,000 feet, or more than a mile, by natural processes. A mine in Westphalia has 117 seams of coal one above another.[2] Many periods of growth under swamp conditions, each respectively followed by a covering over, would have been necessary to produce coal in the peat-bog manner. More likely, successive layers of vegetation were washed down and buried by layers of gravel that washed in from the nearby rising mountains or by the giant tidal waves that took off the tops of the mountains.

When a tree falls in the forest the various processes of decay set in. Moss, fungus, mold, and insects soon help it rot. Is any coal formed?

In order for coal to form there must be at least a partial exclusion of air during decay and some pressure to compress it. That is why coal does not form from the natural death of trees today. Leaves fall every year, rotting and forming soil on the forest floor. The trees themselves die and fall in a storm. Immediately the forces of disintegration begin to work. Ants and termites enter the wood. Boring beetles make additional holes, which let in moisture. The part of the tree that

Open-pit mining exposes layers of coal near the surface.

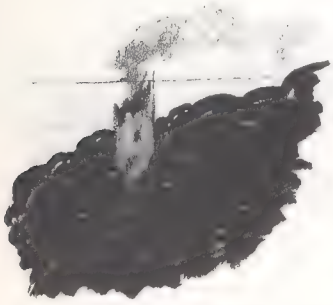
touches the ground remains damp, and the bacteria of decay thrive. Fungi grow on the trunk. Moss covers it with a green blanket that not only beautifies it but also holds moisture and encourages rot. In a few years the solid wood is broken down to form soil that nourishes the other growing trees.

The great masses of vegetation that were uprooted by the waters of the Flood floated for a while in dense rafts. As the water receded, these settled against hillsides, where they were buried by sediments from streams and rivers and by the dust blown by winds and by the earth-shaping forces mentioned earlier. The exclusion of air, the pressure, and the degree of heat generated in the folding and faulting determined whether it turned out to be hard or soft coal.

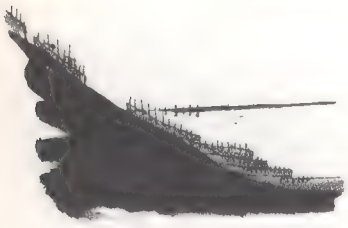
In some areas of the world there are found trees that have petrified, or turned into stone. In the Petrified Forest National Park in northern Arizona there are six such "forests." They are not really forests, but areas where driftwood has been washed together and left in silt and sand either by the waters of the Flood or by the large rivers that drained the waters afterward. Why did not this wood turn to coal? Probably because it was not buried under pressure, but instead left under water for a while. The water prevented the oxygen,

Why do logs petrify, or turn to stone, in some cases and not in others?

One of the species of trees most common in the petrified forests of Arizona is the Norfolk Island pine. It still grows in the South Pacific and also is a familiar potted plant.



At times when a stump may be surrounded by lava under water it can be preserved as a cast. The wood decays, and the hole later fills in with silt, which solidifies.



Sometimes when trees are buried in volcanic ash under water they petrify. This may have happened to the fossil forests of Yellowstone National Park.

insects, fungi, and bacteria from decomposing it.

This water was apparently saturated with silicates, or glass compounds (in this case chalcedony and agate) that it had dissolved, probably from volcanic ash. As the water evaporated and the solution became stronger the silicates precipitated into the wood, filling the cells till it became solid stone. The streaks of color in these logs often represent deposits of iron and manganese oxide. These help to make polished sections of petrified wood very attractive.

The general type of tree most abundant in the petrified forest in Arizona is similar to the Norfolk Island pine, said by geologists to be 150 million years old. This species is still growing on the islands of that name in the South Pacific and has also been introduced into some public parks. Scientists used to think that it took ages for wood to petrify. More recent studies indicate that it can happen in a matter of a few years or even months when the mineral solution in the water is supersaturated.

When lava flows over organic objects under water a cast can form. A tree may be surrounded and charred, but the lava hardens and cools before the tree is consumed because it is under water. As the tree rots out the hole remains for millenniums after. This happened to a rhinoceros that was buried under water by lava in central Washington.[3]

Volcanic ash also may bury trees that later rot and leave the holes where they have been. Such phenomena need not date to the time of the Flood, but could be quite recent, as they happen today in volcanic areas. At other times when trees are buried in volcanic ash and broken rock under water they can easily become petrified, as found in the fossil forests of the Yellowstone National Park. These may have been successive landslides from pre-Flood forests that were uplifted, covered with volcanic debris, and then slid one on top of another into the dammed up waters remaining from the Flood.[4] Another common view is that they grew in successive stands and were buried where they grew. If this were the case they possibly grew very rapidly—many of the stumps do show thick growth rings.

Geologists do not seem to know just how the oil was formed that is pumped from the earth. They do have what they refer to as the "organic theory," but it does not altogether satisfy them. Briefly stated, this theory proposes that millions of years ago in the great oceans covering parts of the earth, dying animal life was buried under silt sediments. These later

turned into rock and were raised up as dry land. According to theory the oil from this animal life was compressed out and, being lighter than water, it rose above the water level till it was trapped under the nonporous rock layers.

Creationists can agree with most of this theory, with certain changes. They do not believe it happened millions of years ago, but they do believe the great seas were the waters of the Flood of Noah's time. It is difficult to conceive of enough animals dying of old age to accumulate and form as much oil as is found in some of today's deposits. Also, in the slow process of time bacterial decay and marine life would have disintegrated any oil that might have formed.

The story of the Flood, on the other hand, makes things more plausible. The abundance of animal and plant life in the antediluvian world would have been an enormous source of supply. Fossil remains indicate that there were not only many varieties of animals at that time but also great numbers of them. The waters were full of large swimming reptiles, and the shallows held still larger dinosaurs. Whales may also have been common. All these animals carried abundant fat as blubber and would have produced a large supply of oil, but not if they were allowed to decay.

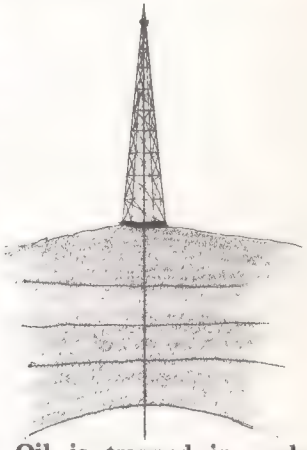
These marine animals were washed together by the Flood waters and buried en masse in turbulent mud. Compressed by loads of silt and gravel beds laid down by giant waves before they had time to decay, they produced the reservoirs of oil that are found today. Many plants also produce oil, and could have done so when buried by the Flood and heated by volcanism or pressure.

Then when the earth wrinkled as the layers of the earth's surface were pushed together, pockets formed under dense layers of sediments, and the oil rose from the compressed organic matter below. The water table forced the oil to the top. It is these pockets that the oilmen spend millions of dollars to find and exploit. Sometimes the oil is under pressure and it spouts out as a "gusher." At other times it has to be pumped out of the reservoir where it lies.

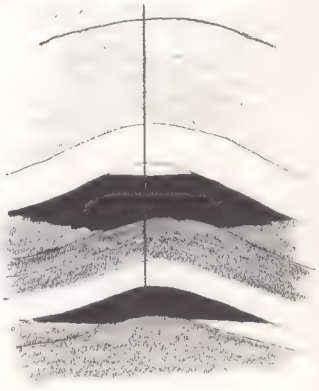
Much of the oil is volatile, meaning that it evaporates. This vapor or gas gathers at the top of the pocket and is taken off as natural gas to be used for heating. In some parts of the earth this natural gas is abundant and seeps out of the earth through broken layers of sediment. It has become an important resource to man in recent years.

Oil is not always found as a liquid, but may be in the form

The waters before the Flood were full of large oil-yielding monsters that could well have contributed to the supplies now found.

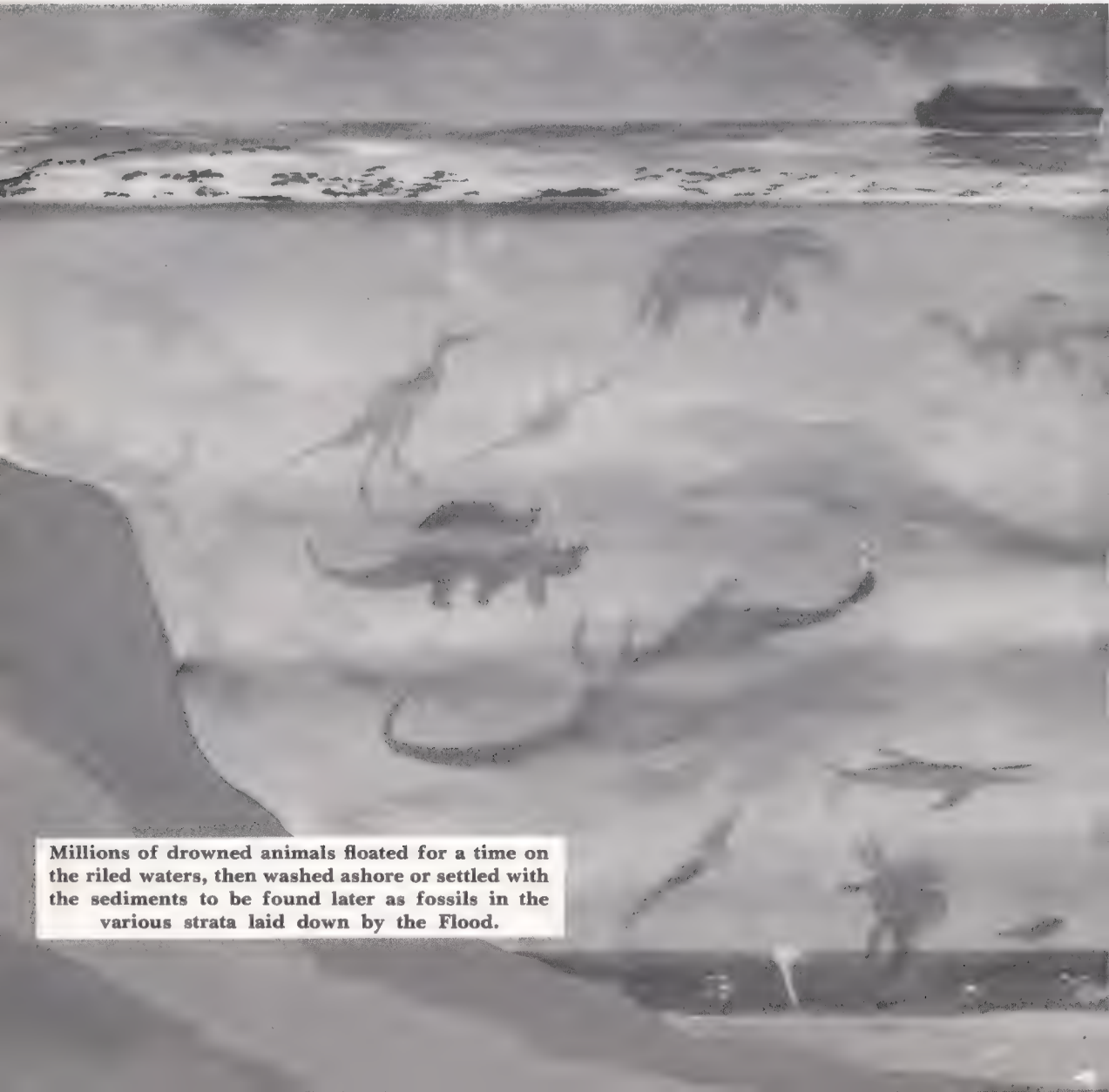


Oil is trapped in pockets under wrinkled layers of nonporous rock. It is these pockets that oilmen spend millions of dollars to find and exploit.



of oil shale, an oil-soaked porous rock that has to be heated to make it give off oil. It is found in large areas in Wyoming, Utah, and Colorado. These oil reserves can be used when other more readily available sources are depleted.

In northern Alberta, Canada, there are vast areas of sands, permeated with a heavy tarry substance. These can also be made to yield oil, though at a greater cost than that coming from wells. The sources of the oils are similar.



Millions of drowned animals floated for a time on the riled waters, then washed ashore or settled with the sediments to be found later as fossils in the various strata laid down by the Flood.

We may wonder about tar—the pits at La Brea in California, the Pitch Lake in Trinidad, the tar on the Babylonian plains that was used to heat the fiery furnace seven times hotter in Daniel's time. And of course all the tar, bitumen, or blacktop that is used in paving roads.

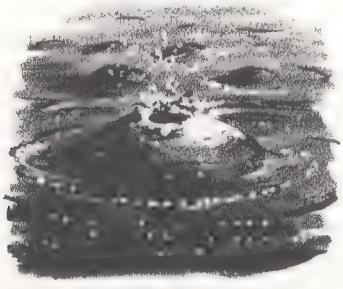
Actually tar of this kind is residual oil. When oil is refined the natural gas, as the most volatile, comes off first; next the high-octane gas, then the ordinary gas; after that comes the Diesel oil. The heavier hydrocarbons or tarry residues remain. The oils and coals are closely related. Coal tar comes from coal, which is of vegetable origin.

There is a lake of tar in Trinidad that is about three miles around. There are 104 acres of tar in the whole area. Here tar is continually mined but keeps coming in to fill the excavated places. It is not a limitless supply, but continually oozes up from below, where it is more fluid. The road from Pitch Lake to the port is on asphalt that, like a glacier, is said to move slowly toward the sea.

Apparently the Lord, in the great Flood, preserved large quantities of organic materials to be discovered and used in later times as coal, oil, and tar for the benefit of man.

[1] Harold W. Clark. 1946. *The New Diluvialism.* P. 20.
[2] ———. *Ibid.* P. 21.
[3] Harold G. Coffin. 1969. *Creation—Accident or Design?* Pp. 258, 259.
[4] ———. *Ibid.* Pp. 134-138.

In refining oil the natural gas and high-octane gas, being more volatile, comes off first. Then follow gasoline, kerosene, Diesel oil, heavy hydrocarbons, and tarry residues.

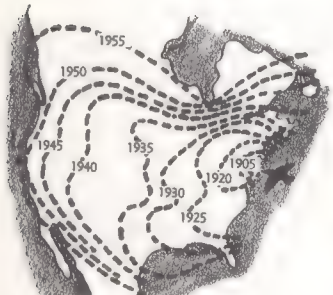


Oil is not always found as a liquid, but may be in the form of tar sands or in tar pits such as La Brea in California, and Pitch Lake in Trinidad.

14

Wandering Animals

A map of the Old World shows that most of it would be easily accessible from Mount Ararat, and migrating animals should have had no trouble reaching all of it.



Starlings spread across North America within 50 years after they were introduced from Europe.

AFTER THE ANIMALS were released from the ark they probably lived for a short time in the mountain valleys near Ararat. As winter approached there would be a tendency to gravitate to the lower valleys where the climate was warmer. Spring saw a return of some animals to the mountains, but some would always wander away, and thus the dispersion began.

As the population of animals increased, the pressures of "lebensraum" created an outward movement. Young animals naturally moved out of the territorial claims of their parents to find new homes for themselves. Their young would do the same in their turn. Smaller animals with high fertility rates would have a tendency to spread rapidly. Larger animals might not increase as rapidly, but would still travel far because they required larger individual territories.

Seeds of plants, since most of them float, could have survived the Flood—grass, flowers, shrubs, and trees doubtless were soon growing all over the world. In this way the roaming animals would always find green pastures farther away, and there would always be "grass beyond the mountains."

The herbivorous animals were most likely the forerunners of the expanding horde, since there was already food for them, and also because some of them were preserved by sevens in the ark instead of by twos. They were naturally followed by the beasts and birds of prey. Their pursuit of the vegetarians may even have caused them to spread more rapidly than they might otherwise.

In the relatively short period of a few centuries animal life could have covered most of Europe, Asia, and Africa, since these areas are all quite readily accessible from the region of Mount Ararat. Deserts now form barriers to some types of

animals. But during the cool, wet climate that produced the continental glaciers these barren wildernesses would have been more liveable than they are now. Historical and archeological evidence indicates that forests once covered many mountains now bare, and that people once lived in the Sahara desert, for they left a record on the walls of caves in which they lived, of their life and the animals they hunted.

How many years or centuries elapsed between the Flood and the ice age we do not know. Evidently there was enough time for many species of animals to cross from Asia through Alaska to the Americas and become well established here. Massive migration also took place during the time of the continental glaciers over the land bridges that were then exposed.

There are many ways in which animals could have crossed over from Asia besides land bridges. They could have come by swimming, on ice, on driftwood. Or they could have been transported by man on rafts or boats. It is also possible that the land rose exposing the Bering Strait even before the time of the continental ice.

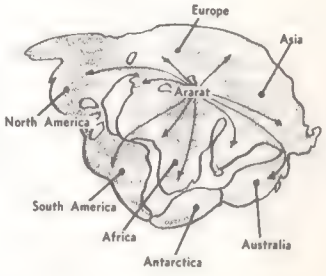
Large portions of Alaska were bare of ice during the summers and the meadows were green and attractive. Wandering animals can travel far in one summer. They could easily have come far down the Alberta corridor before that part of the world became covered with winter snow. Range horses and cattle stay out all winter in much of Alberta today; those early migrants probably also managed, or were hurried south by the coming frosts of winter.

Another theory for the distribution of men and animals is posed by the drift of continents suggested earlier. If the Americas, Europe, Africa, Asia, and Australia were once parts of one large supercontinent, animal life could have spread widely over them shortly after the Flood, before oceans separated them.

Usually when we read the text in Genesis 10:25 about one of the descendants of Shem who was called Peleg because in his days "was the earth divided," we think that it refers to the division of languages at the Tower of Babel. But it may also have referred to a literal dividing of the earth into its several continents.

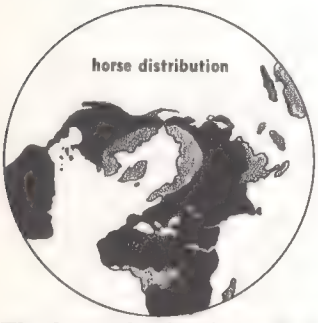
It may help our understanding of the distribution of animal life to try to trace what happened to a few of the well-known branches. The deer apparently moved from Ararat toward Europe, then eastward through the forest belt of

As demonstrated by the periodic migration of lemmings, the plant eaters come first and the birds and beasts of prey follow them.



Suppose the continents had been massed together after the Flood before "the earth was divided." The theory of continental drift is now becoming generally accepted. It would answer some of the problems of animal distribution that we have.

Even though the Old World was all open to the deer family, they "chose" not to go down into Africa, but went to America instead.



The horse family, including the asses and zebras, inhabited most of the open plains of the world, except for Australia, which they apparently did not reach in time.

Russia and Siberia. Some of them wandered south into the forested mountains of Asia. Some reached Northern Africa, but they did not flourish there. When the deer separated so widely they developed into different types. Some were large and heavy-antlered, others medium sized, and still others were small and lived in the dense jungles. Some, such as the caribou and the moose, developed palmated antlers; others had only small spikes.

A number of these newly developed species prospered and grew into large herds of true breeding animals that did not cross with other species of deer. They predominated wherever they found habitats that suited them. The European red deer is an example, spreading from its place of origin to the mountains of Asia and across to America, where we call it "elk," or more correctly, wapiti. What we call a moose in America is the elk of Europe. It also crossed over to America and is now the largest of all deer.

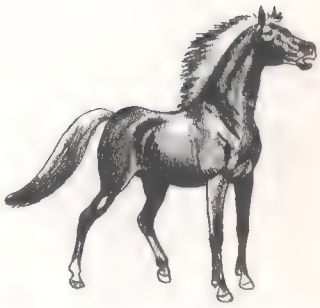
The smallest is the pudu, of Chile, no bigger than a dog. The roe deer of Europe ranges in some of the same countries as the red, but lives in different habitats. Caribou is another member of the deer family that has found its way over all the northern lands. In the Old World it is known as the reindeer.

The horse tribe migrated across most of the plains of the Old World and developed into several distinct branches. There were, in addition to the common horse, the zebras of Africa, and the wild and domestic asses of the Old World deserts.

The domestic horse came from the two main branches of the original stock. One type lived on the open plains and arid steppes. It developed into a lightfooted, hardy steed and roamed from Northern Africa to Outer Mongolia. The first intimation of horses in the Bible is in the story of Joseph, when he rode in Pharaoh's chariot.[1] Abraham had camels, asses, sheep, and cattle, but not horses. Moses forbade future rulers of Israel to multiply horses to themselves.[2] When David defeated the Zobahites he captured many horses, but did away with most of them, probably in obedience to the commands of Moses.[3] His son, Solomon, however, kept large stables of horses.

There appears to be little mention either in the Bible or in ancient history of people riding horses till about Esther's time in Assyria. After that they came into use in the Persian and Greek armies. The Arabs, of course, became some of the best horsemen in the world, and the Huns and Tartars also.

The plains horse apparently crossed over into America not long after the Flood. It may have come with man in boats or rafts or on its own, but it found the country so much to its liking that it multiplied rapidly and soon developed into several distinct kinds in the varying habitats to be discussed later. They also spread to some of the surrounding islands in the Caribbean, perhaps when these were connected to the continent during the ice age. Then through some catastrophe, whether starvation, cold, disease, or a combination of several factors, all the horses in America became extinct. This may have taken place at the same time as the mammoths, camels, giant hogs, and other large animals died out, perhaps as late as the Middle Ages.[4]



The Haitian wild horse may be a remnant of those that inhabited the Americas but became extinct before the time of Columbus.

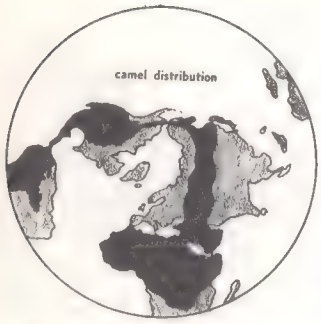
In the high pine forests of Haiti there is, or has been till recently, a breed of wild horses. They are all of the same color, a strawberry roan with silver-gray, black-tipped mane and tail. These bands do not interbreed with the feral (domestic gone wild) horses on the island, but fight them. It is thought that they may be remnants of the great herds that once roamed the American plains, and that these isolated bands alone survived when all the others became extinct.[5]

In the Old World the last of the wild horses are those known as Przewalski's. They lived on the steppes of Russia, southern Siberia, and Northern China. The ones in Europe are now all gone. The story of the capture of the last one is interesting, but too long to repeat here.[6] Those seen in zoos today are descendants of 28 captured in Mongolia in 1950. It is not known whether any more wild ones exist.

Przewalski's horse, now found only in zoos, is the remnant of the wild plains horses that once lived all over the plains of Asia.

The other of the two types of horse mentioned as having been the ancestors of the domestic horses, developed in the forest country of Europe and the grassy meadows of the low countries. It became large and stocky and was known as the forest horse, also as the tarpan. This animal was at first hunted and eaten by the early Europeans, sometimes by driving it over cliffs. Later it was domesticated and developed as a farm and war horse (with early emphasis on war). It took a great horse, as it was called, to carry a knight in full armor into battle. In Scotland and Wales, however, some of these horses became quite stunted. From them came the Shetlanders and the Welsh ponies. This produced among the descendants of the forest horse a range in size greater than that of the early American series. The shire weighs up to 2,300 pounds while some of the dwarf Welsh ponies are not much more than 50 pounds when full grown.

The forest horse of Northern Europe has developed into many useful farm animals. They range in size from the giant 2,300-pound Shire, to the dwarf Welsh ponies that may be no more than 50 pounds when fully grown.



Camels also spread over much of the world, but chose the drier sections. Like the horses, they became extinct in North America, but in South America four small editions survived.

Camels spread across Asia in much the same way as did the horses, but they chose the drier areas. As did the horse, they crossed over into America and developed into several species here. Post-Flood American fossils show a giant camel 15 feet tall, and a number of other slim, long-necked, smaller species. These early camels were very plentiful on the Western plains. There is reason to believe that they did not become altogether extinct till shortly before the time of Columbus, because their bones have been found at old Indian campfires.[7] All are gone from North America now, but in South America there are still four survivors—the llama, guanaco, alpaca, and vicuña.

Attempts to bring the Asian camels to America during the Civil War failed. Unlike the horse, they did not adapt or prosper. Even though camels escaped and ran wild, they did not thrive—the last feral camel in the United States died in 1913.

In Asia wild camels lived in the region around Lob Nor and Bagrach Kol, Mongolia, till early 1900. These were the Bactrian, or two-humped, camels.[8] The one-humped variety has not been known in the wild in historic times. It may have been domesticated shortly after the time of the Flood, since it is mentioned as livestock during the time of Abraham and Job.

Bactrian camels have lived wild in Mongolia till as late as 1920. The one-humped species has not been known in the wild in historic times.

The rhinoceros is found today in Africa, India, Java, and Sumatra. In prehistoric times the woolly rhinoceros roamed all over Europe and Northern Asia, and at least two species of rhinoceros were found in America's Western plains. A hippopotamus also wallowed in American rivers, and a giant hog six feet tall and 11 feet long towered over the small horses of that time.

Woolly rhinoceroses roamed over much of Europe, Northern Asia, and North America for some time after the Flood, but then they became extinct.

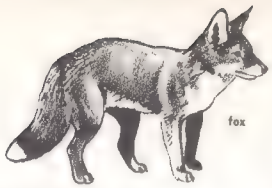
The distribution of the dog family is quite extensive. Wolves have roamed through all the polar and temperate zones of the Northern Hemisphere. The fact that there is so little difference in the wolves of the whole area indicates that they must travel widely and interbreed back and forth. Animals that as individual pairs tend to keep to a small locality soon develop into numerous races, while those that cover a wide range soon average out into one similar species covering a large geographical area—even though individual animals in these types may vary considerably in color. Among wolves there may be black pups and white pups in the same litter.

Foxes also are widespread over the same area as wolves. In some locations—because of isolation, different habitat, or

habits—they have developed into distinct species such as the arctic, kit, gray, fennec, and others. Jackals have remained in the Old World and are found in both Africa and Asia. The cape hunting dog is a distinctively colored species that runs wild in Southern Africa.

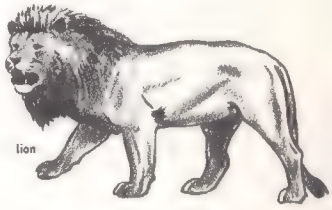
In Australia the pouched Tasmanian wolf is apparently a development of the marsupials rather than of the dog family. The dingo, on the other hand, is a true dog that was brought into Australia by man in early times. A study of the great variety of domestic dogs that have been developed by man, many in recent years, shows what a great difference can come about in a comparatively short time. The St. Bernard and the whippet, or the German shepherd and the Pekinese are examples.

The distribution of the cat tribe parallels that of the dog. It is widespread, with many wild representatives and also many domesticated breeds that have been transplanted by man beyond what would have been, for them, natural barriers. In the early sailing days cats were carried on board ships to control rats, and both cat and rat were transported across the seven seas.



The dog family is to be found over most of the habitable world except for a number of islands.

Cats have also spread widely over the world in many forms, sometimes with the help of man.



We soon notice an interesting aspect of the distribution of animal life. Though continents apart, habitats may be quite similar and when they are, the creatures that inhabit them are also similar. A trained biological collector can often predict the type of habitat from which an unknown collected specimen has come. Not only does a species change according to the variations within its habitat (divergence), but animals that are continents apart but live in similar habitats also develop in similar ways (convergence).

In the American Southwestern deserts live several species of kangaroo rats that vary according to the differences in their local habitats, but all hop around on long hind legs, have long tufted tails, and cheek pouches. In the Sahara desert and also in the Asian deserts there lives a similar rodent called the jerboa, built along similar lines but not closely related. In the

The kangaroo rat, jerboa, and pichi pichi live in widely separated deserts of the world and are similar, yet not closely related.

In widely separated rain forests of the world live the bush babies, tarsiers, and marmosets. All belong to the monkey family and are similar in many ways, but they have developed independently to fit the respective niches they occupy.

Australian deserts is still another similar animal called the pichi pichi, or Australian jerboa. It has some of the characteristics of the marsupials, but is not pouched. Though similar to the other two, it is not closely related.

In addition to these similar desert animals, there are also similar grassland types such as the jack rabbit of America, the springhaas of South Africa, and the hare wallaby of Australia.

The jungles of the world contain various species of monkeys. Among the monkeys of the New World there are no baboons, tarsiers, or apes, but there are many with prehensile tails. In the Old World there are no monkeys with prehensile tails, but many of other species.

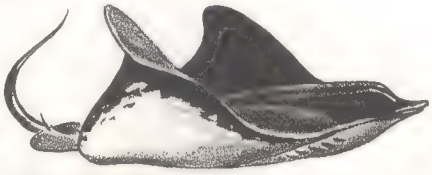
In the dense rain forests of Central Africa there are bush babies, small vegetarian primates that leap from tree to tree in the dark. In Sumatra, the Philippines, and nearby islands live the tarsiers, small primates that hop around in the trees at night catching insects. The South American jungles have their counterparts in the marmosets. North American temperate forests have squirrels to occupy this niche, and in the Australian forests the tree kangaroo and tree opossum take their place.

North America has flying squirrels that volplane from tree to tree by means of the buoyancy supplied by a loose membrane stretched between their four feet and tail. From Indo-China to the Philippines there is a flying lemur that is about the same size and flies in the same way. Australia has the feather-tailed and sugar gliders, both marsupials, that look and act like flying squirrels. In other parts of the world there are frogs, snakes, fish, lizards, and even rays that glide in the air by spreading their membranes, fins, or, in the case of the snake, its ribs, to increase their buoyancy.

Then, too, there are a number of reptiles, fish, and amphibians that volplane through the air.

From the Malay Archipelago some animals were able to cross over to Australia at one time, then the land bridge closed and those that came later were unable to cross. This apparently left most of the marsupials stranded in New Guinea and Australia. The only marsupials that went in any other direction and survived came to America. They are the opossums and the opossum rats.

The Australian marsupials developed in a wide variety of ways to fill the various habitat niches that were unoccupied on that continent, producing very unusual animals, some of which have already been mentioned. Those that came to the Western Hemisphere developed into only one species in



North America and three in South America, because other animals had already filled the biological niches or were more aggressive in doing so.

Sometimes mountain ranges are fairly closely connected from one continent to another. As may be seen from a topographical map, the mountains of North Africa, Arabia, Asia Minor, Asia, and North and South America are all somewhat closely connected. A study of mountain sheep shows that they are found along most of these mountains in the Northern Hemisphere.

The different species vary from the aoudad in the Atlas mountains in North Africa to the mouflon, red, urial, bharal, Marco Polo, and argali of Asia to the dall, stone, Rocky Mountain, and desert mountain sheep of our Southwest. There they stop. They have crossed wide stretches of desert in some places to get from one range to another, but the tropical jungles were apparently not to their liking. Some of the mountains of South America might have been ideal for them, but they were instead taken over by the little camels. These may have arrived sooner, perhaps under different climatic conditions. In some ways they developed as did the sheep—the alpaca even grows wool.

The limiting influence of land bridges on the spread of animal life had some curious results. It isolated certain groups of animals. There are more than 30 families of birds, 20 families of fresh-water fish, and quite a few families of mammals that are found only in the New World. This means that they either died out in the Old World entirely without leaving a trace, or that they developed in the New World from kinds that crossed over from Asia. The birds and fish were of course not as limited by land bridges as were the mammals, but they still had to change much from their original kinds to be separate families as they are, not merely different species.

Among the American families of mammals are the pocket gophers, kangaroo rats, chinchillas, cebid monkeys, and armadillos. The entire order of Edentata, to which the armadillos and American anteaters belong, is represented only in the New World. The order of Monotremata, which contains the platypus and echidna, is found only in Australia, Tasmania, and New Guinea. This means that these groups of animals, comparable in classification to the rodents or the carnivors (meat eaters), must have traveled all the way from Ararat to these faraway lands and developed only there into their several species that exist now or have existed in the past.

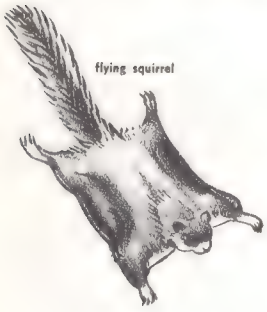
Many families of animals are found only in the New World. Among them are the pocket gophers, armadillos, chinchillas, and cebid monkeys.

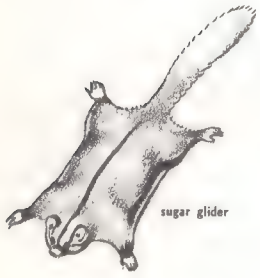
They apparently left no branches of their orders in countries along the way.

An interesting fact in this connection is that fossil members of families are usually found in continents where the living representatives now reside. This raises the question of whether the fossils date from before the Flood or after. This will be discussed more fully in a later chapter.

Only a few isolated facts have been considered here in the fascinating study of animal distribution. They suggest what might have happened after the Flood. The entire subject deserves a much more complete study than has to date been given to it, and it is hoped that someone will feel inspired to study further into it.

We also have the flying squirrel, sugar glider, flying lemur, and giant flying phalanger that look and "fly" alike, yet they belong to three different orders of mammals.





[1] Gen. 41:43.
[2] Deut. 17:16.
[3] 2 Sam. 8:4.
[4] Willy Ley. 1951. *Dragons in Amber.* P. 258.
[5] Ivan Sanderson. *Living Treasure.* P. 32.
[6] Willy Ley. 1948. *The Lungfish, the Dodo, and the Unicorn.* The Viking Press, New York. P. 193.
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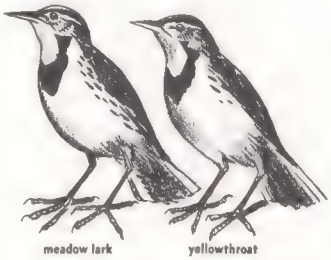
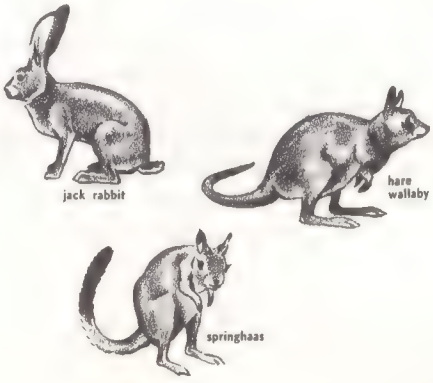


The meadow lark and yellowthroat longclaw look similar, but are unrelated. They too are examples of converging development related to environment.

Jack rabbits, springhaas, and hare wallabies are unrelated and live in widely separated countries, yet they have developed similarly in habits, size, and appearance.

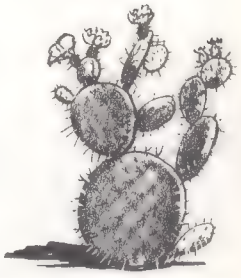


15

Adjustment and Survival

ONE OF THE preceding chapters outlined the various ways in which deserts developed in the earth after the Flood. Attention also was called to some of the unusual plants and animals that live there. These organisms were of course not created for the desert environment, because in the beginning there was no desert. It follows that they must have adapted to the changed habitat in order to live. Slowly, generation by generation, they changed to fit not only the desert but also other environments that would be considered far from ideal, till now they seem remarkably well suited to the respective places where they live.

Had deserts come suddenly—and they may have in some places—the animals and plants in that area would have died, or in the case of the animals, migrated away. They would not have had a chance to adapt. However, all deserts have marginal areas, and it is here that most of the changing takes place. This is where the plants most suited to desert life, or most flexible, are sorted out and developed through Nature's processes to withstand that type of climate. Those that cannot stand the drought die. The more hardy ones endure and live on to propagate still more hardy descendants.



The prickly pear cactus is an example of a plant that was able to adjust to desert life and survived when dry areas came into being on the earth.

Fleshy plants with tough skin can store a lot of water to last through the dry spells. That is one reason why cacti survive in the desert habitat. If Luther Burbank could develop a prickly pear cactus without thorns, as he did, it follows that the opposite development could also take place. Thirsty animals in the desert would eat the juicy plants first; those with thorny armament would survive to propagate others of their kind.

We are told that thorns and thistles appeared when sin entered the world, so there must have been thorny plants before the Flood. In the mild, lush climate of that time the need

Did plants begin to grow thorns because of the need for them?

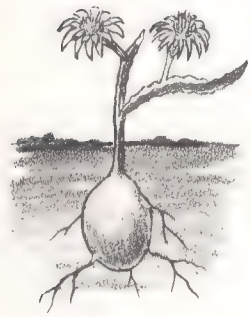
for thorns as protection was not as great as it is now, but the mutations causing them persisted, till now nearly every plant in the desert has thorns. Plants do not consciously realize the need for thorns and start to grow them, but in a dry climate it is natural for a plant to grow thorns. A pear tree growing on a dry ridge in an orchard, left more or less untended, soon grows thorns even though pear trees ordinarily do not. Often thorns start out as twigs that become stunted and dried. The thorns on the ocotillo are actually the stems and midribs of leaves. Some thorny plants grown in humid greenhouses often do not produce thorns.[1]

Most desert plants stay dormant during the dry season, which in some places may last for years. The annuals, of course, live on in their seeds. When rains come they germinate quickly, grow, and burst out in a profusion of flowers that produce abundant seeds in a short time. For plants to survive in the desert it is necessary that they produce many large seeds, for only a few will be able to find suitable cracks where they can hide and wait till the next rains come. It has been estimated that desert annuals in some places drop 1.5 billion seeds per acre. Of these only a few mature into plants; the rest go to feed the quail, kangaroo rats, mice, and ants.

Seeds on desert plants such as the piñon pine are much larger than they are on related pines growing in wetter climates.

Seeds on desert plants are often considerably larger than they are on similar species in areas where they get more rainfall. Compare the seeds of the piñon pines with the much smaller ones of the jack pine. It is fortunate for the desert rodents and birds that Nature is so prodigal, for they live on the excess that might never germinate anyway.

On many of the western hillsides there is a grass that grows quickly in the spring, making the hillsides green and giving promise of good pasture to come. Then with the first hot sun and dry spell, when it is still only two or three inches tall, it goes to seed and dies, leaving the ground littered with its millions of tiny barbed seeds but no grass or hay. The ranchers call it "cheat" because it did not fulfill its promise. It is, however, a typical dry-country plant and is in this way able to survive.



Some plants, such as the night-blooming cereus, store food and water in large underground bulbs.

Desert plants have other ways of meeting the water shortage. The night-blooming cereus stores food and water in a large bulb underground. This reserve takes years to build up, then when the plant is ready and the season is right, the food is rapidly expended in the lovely blooms that are pollinated by night-flying moths.

Century plants operate on a smiliar principle, but they

store food and water in their thick, leathery leaves, fringed with spines, that grow in a basal rosette. When the plant is ready to bloom the tall flowering stem grows unbelievably rapidly. After the blooming and the production of seeds the store is exhausted and the plant dies. This cycle does not take place every hundred years as the name signifies, but from five to 60 years varying with the species, the soil, and weather conditions.

The tall saguaro has a wide-spreading root system, of a diameter equal to the height of the plant, that rapidly gathers moisture from every rainfall and stores it in its fluted stem. This heavy trunk can expand as it takes in water and shrink as it loses it. A heavy ring of supporting rods keeps the stem from becoming flabby in time of drought.

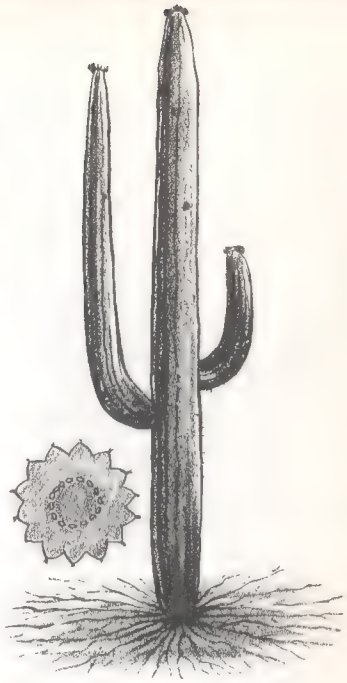
Most desert plants have small leaves and lose them when the rains are over, or else they have none at all. In the latter case photosynthesis takes place in the greenish-gray twigs. Leaves breathe, losing moisture into the air, a luxury that desert plants cannot afford.

Bushes are often so evenly spaced in the desert that they look as if they had been planted. Studies show that this is not only because of the competition for moisture by the root systems of the individual plants but also because some have poison in their fallen leaves that kills the seedlings near them.[2] This unusual protection helps these plants to survive in the ruthless competition for water.

Reptiles are fairly well adapted to desert life in many ways, but they too have to make adjustments. They usually stay in their burrows during the hottest part of the day to conserve body moisture. The small lizards and horned toads hunt insects in the shade of the mesquite or prickly pear. Snakes hunt the lizards and whatever else they can find. Usually these reptiles survive on the barest minimum of water, most of which comes from the food they eat. Desert tortoises supplement their water supply by biting chunks out of the prickly pear cactus.

Birds also find ways of adjusting to the uncertainties of water in desert areas. Their flying ability enables them to cover greater distances to get to water than some of their earthbound neighbors, but they still have problems. Desert quail raise few young in dry years because of a lack of vitamin A, usually obtained from green leaves. In wetter years when leaves are plentiful they raise large families.

Because of the desert's bareness and lack of shelter from



The tall saguaro gathers moisture and food in its heavy, fluted stem, which expands to receive it.

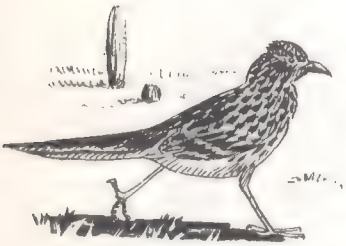
Desert bushes are often spaced and look as if they had been planted. Why is this so?

Desert quail raise few young during dry years, but large families when the rainfall increases. Why?

Vultures escape the heat by rising on thermal updrafts to the cool air above, from where they look for their food.

heat, both birds and animals congregate in gullies, which often can hardly be seen until one is right upon them. A surprising amount of wildlife operates from them. They, as well as the larger washes where streams run when it rains, usually have some bushes and trees that bear seeds that attract insects, birds, and rodents. These in turn attract the carnivores.

The extreme heat is more than some birds can stand, but the vultures rise high on thermal updrafts and float along in the cool air looking for food. Road runners pant under the bushes, but occasionally dart out of the shade to snatch an unwary lizard. Most birds brood their eggs to keep them warm, but a meadow lark was observed in Death Valley shading its nest with its wings to keep the eggs from getting too hot.



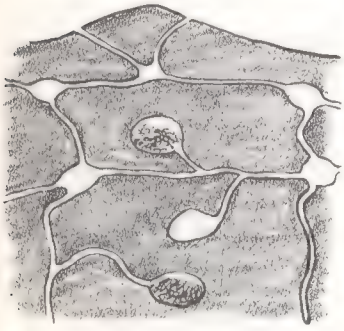
Road runners may pant under bushes when it is hot, but they dart out occasionally to snatch an unwary lizard.

The blacktail jack rabbit is common in the Western deserts. It feeds largely on the leaves and bark of the mesquite, sage brush, and almost any other plant that is edible. During the driest part of the year it also eats pulpy cactus to maintain its water supply.

Roundtail ground squirrels live in some of the hottest deserts of the West and seem to have adjusted well to its extremes. The lively antelope ground squirrels scamper gaily over the sandy earth of the less dry deserts, with their tails held jauntily over their backs. Both these ground squirrels are able to convert into water the starches from the grains they eat, but they still drink when they have an opportunity. Some southern ground squirrels estivate (sleep) during the hottest part of the summer and are active during the winter.

The roundtail and the lively antelope ground squirrels have adjusted well to the desert's extremes of temperature.

Kangaroo rats dig burrows in the sand, living in these cool basements during the day. At night they hop around like little sprites and gather seeds of the many leguminous plants that grow in the washes. They pile up the seeds in underground stores, thriving on their way of life. Like the ground squirrels, they can also make water out of the starches in their food—they can go for a whole lifetime without drinking. Those kept in captivity do not drink even if water is kept in their cages.



Kangaroo rats live in cool underground "catacombs" during the day. They can make water out of their food and never need to drink.

Another common animal of the desert, the pack rat, lives in piles of brush it has gathered together. It comes out at night to patter over the cactus-covered ground on its soft, pink feet, and to chew the pulp of the prickly pear cactus. The gray fox, kit fox, bobcat, ringtail, and coyote all live by hunting these rodents. They range more widely than their prey and are more likely to find water to supplement their food. Peccaries, desert sheep, and mule deer are also more dependent upon water and are usually found only within range of a water hole

that may be left in the bed of an otherwise dry stream.

The intense cold of the arctic seems to make it uninhabitable, but it still sustains abundant life, though the number of species is limited. Where glaciers push the icebergs into the sea, the water around the melting ice is less salty than the rest of the ocean. Swarms of shrimp and other forms of small sea animals multiply there. These provide a rich source of food for the whales, which migrate to the polar regions as soon as the ice breaks in spring to feed on these pastures of "krill," as the whalers call it.

Fish also come to feed on this harvest of the sea. Seals and sea lions feed on the fish, and polar bears on the seals. Walruses eat the shellfish that abound in the shallow seas, while Eskimos hunt the seals, bears, walruses, and white whales. Arctic foxes and dogs clean up the remains and complete the predatory cycle that was stimulated by the melting of the ice.

On land the arctic hares hop about on the tundra to nibble at the grass and stunted willows that protrude above the snow. Lemmings burrow underfoot in the moss and lichens between the snow and the frozen earth to find their living. The white ermine makes his living by finding them. Musk oxen in their heavy overcoats graze on the rich grass that is exposed where the wind has blown away the snow. They all keep a wary eye open for the white wolf, who is ever on the trail.

The antarctic is an isolated land mass that has not been reached by mammals except for those that live in the water, but there is plenty of bird life and the waters are alive with fish and shrimp. Here too the whales and fish feed on krill, the penguins feed on the fish and shrimp; and the leopard seals and skuas (large predatory gulls) feed on the penguins. All seem to thrive.

Of course the polar regions are not always frozen. During the short summer when the sun shines 24 hours a day, things warm up and life really abounds. After the continental glaciers receded the birds began to come farther north from the crowded temperate regions in the summer. They found the north country much to their liking. It was an ideal place to nest for many of them, for there was abundant food in the teeming insect life.

The fast-growing young of some birds have so high a rate of metabolism that they can starve if deprived of food for eight hours. For this reason the long day and the short night suit these birds very well indeed. The stunted plants of the arctic, like those of the desert, bear heavy crops of seeds, and

Peccaries, desert sheep, and mule deer are dependent upon the water holes in the desert and are seldom more than a day's journey from them.

Arctic hares survive the winter by eating the grass and stunted willows that protrude above the snow.

A heavy coat and long skirts protect the musk ox from the arctic cold.

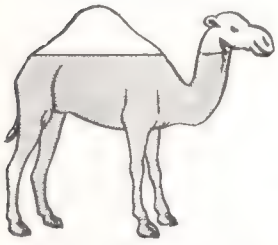
Caribou also make seasonal migrations and spend the coldest months of the year in the southern forest belts.

these help to fatten the young birds before they go south. When the snow comes, covering the seeds and killing the insects, most of the birds fly to warmer climes.

This may well have been a factor in beginning the great migration of birds that is today an annual event. At first the birds traveled only short distances, but soon it was thousands of miles. The urge to go north in spring and south in fall has now become so strongly ingrained into the birds as an instinct that it is followed by the young without even being learned from the parents. Many of the young birds fly ahead of their parents to the southland they have never seen.

In their search for food the caribou also began their seasonal migrations as the glaciers receded. They wandered north into the tundras in summer and south to the food and shelter of the forests in the fall. So life in the marginal polar regions became settled into a routine that made it habitable for many kinds of bird and animal life.

Among the animals as among the plants those most capable of change survived and were able to live in the deserts and polar regions. The camel with its ability to store water in its stomachs and food in its hump is a good example of a large animal that was able to adapt to life in the desert. This, together with its remarkable digestive system that can use the roughest and thorniest plants for food, and that can drink brackish water if necessary, has fitted it to be a desert transport.



The camel, since it could store water and eat rough forage, was able to survive in the desert.

Many animals and birds have become adapted to living on one specialized diet till they are unable to eat other food. The anteater's long snout and cordlike tongue are made to order for catching ants and nothing else. He would hardly know what to do with a vegetarian diet and must have changed quite a bit since Creation.

Some animals, such as the anteater, have so adapted and accustomed themselves to a specialized diet that they would starve to death if ants became extinct.

We cannot be sure what abilities birds had when created, but hummingbirds are so specialized in flying that they can hover, fly backward and forward very smoothly, just as they need to do to get nectar and insects out of tubular flowers. Soaring birds have slotted wing tips to enable them to sail slowly without back slipping. By alternately beating their wings rapidly and folding them, sparrows are able to fly easily through brush and even through chicken wire fences, a useful accomplishment in their habitat.

Quite a number of animals, birds, fish, and reptiles have protective coloring that helps to hide them from their enemies. Some, such as the horned toad, even have jagged pro-

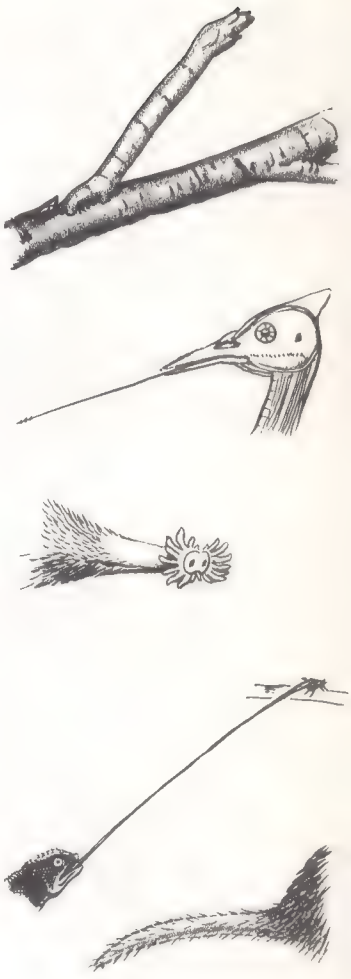
files to help break the outline of the shadow. Insects are also protectively colored and shaped. The walking stick appears identical to the twigs on which it rests. When some measuring worms project themselves at an angle from the twig they are on they look just like another twig, and leaf hoppers and some other insects look very much like the leaves and twigs on which they rest.

Other animals have special adaptations to help them find their prey or to move about. A sensitive fleshy appendage on the end of its nose helps the star-nosed mole to locate worms and insects as it digs with its shovel-like forepaws in the dark. Both moles and pocket gophers have sensitive tails to help them find their way when they back up in their tunnels, as they often need to do. They also have fur that stands up straight like plush and is not rubbed the wrong way regardless of which way they travel.

Chameleons, frogs, and toads have elastic, sticky tongues, which they can flip out of their mouths a considerable distance to hit an insect. They flick it out and back so quickly that the eye can hardly follow the movement. Woodpeckers have long, barbed tongues, the roots of which are so lengthy they have to be wrapped around outside the skull to give them greater power of extension. With his tongue the woodpecker can reach far into an ant's hole in a tree, spear the ant, and bring it back into his mouth.

In the field of parasitology there is also much evidence of change. Parasites were certainly not created as such in a perfect world. They must have developed, each in its own way, to arrive at their respective life cycles. In some cases these life cycles are very complicated. The parasites may live on only one host, or they may live on a series of hosts to complete their life cycles. It was probably not so at all stages of their evolvement. They have become rigid in their patterns of living to the extent that they cannot deviate from them.

There is probably no adaptation so extensive or interesting as that of the Australian marsupials—there is room for more study of these animals in this respect. Classification of animals is admittedly artificial and based largely on sexual and teeth characteristics. On the whole the classifications seem quite reasonable, but there are areas where there is room for doubt. We have reason to wonder whether most of the animals in Australia radiated from one or a few kinds of marsupials or whether the different types become marsupials because of peculiar living conditions. There are many



This measuring worm has adapted protectively to look like a twig, and thus it escapes being eaten. The sensitive fleshy nose of the star-nosed mole and the extra-long spear tongue of the woodpecker are adaptations to help them find food. Chameleons and frogs have flip-out tongues to catch insects, and pocket gophers and moles have sensitive tails to guide them when backing up in their tunnels.

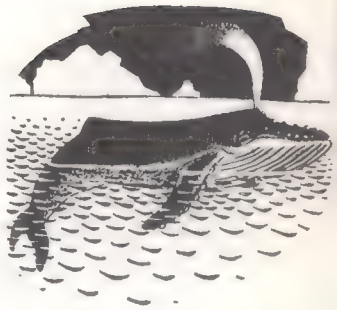
The Australian marsupials have developed in many of the ecological niches that in other countries are occupied by entirely different orders of animals.

different types of pouches represented among them, and some animals that are classed as marsupials do not even have pouches.

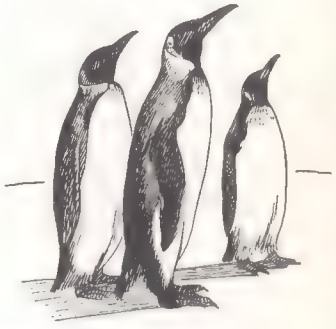
The reason for raising this point is that, though most of the animals in the Land Down Under are classed as marsupials, they range in type from the kangaroo to the mouselike, opossumlike, squirrel-like, bearlike, mole-like, wolflike, raccoonlike, anteaterlike animals. There are still other types represented, as well. How these all developed we do not know. We can be certain that they must be some of the more flexible and adaptable animals on earth.

We have mentioned a number of creatures and plants that have changed through the generations since the Flood. These are only a few of those we might list. As we study them in detail we find that there are many more characteristics about them that must have undergone change to fit them to live in a changing world. We remember too that there were many kinds that were not able to adjust and became extinct. Their bones have been excavated by the thousands. This may serve as a warning to us who also live on a changing world, that we not become too fixed and rigid in our habits and thinking.

This change of which we have been talking is of course not evolution from a simple cell to a complex organism. It is adaptation to environment from a created form to several similar forms, each peculiarly fitted to live and survive in its particular habitat, finding and using the food that is available there. When we study the many different habitats on the earth in its present state, we find there is hardly a place, however bleak, desolate, barren, or frigid it may be, that some creatures have not chosen as their home. What is more, they have become so well adapted to it that all their needs are supplied and they prefer to live there rather than any other place on earth. Satan has sought to corrupt God's created works but God's sustaining power has helped His creatures to survive and adjust to less than ideal conditions on a sin-cursed world.



Whales come to the arctic seas to feed on the krill that is abundant around melting icebergs.



The antarctic has no land mammals, but the penguins feed on the abundant marine life.

[1] Life Nature Library. 1961. *The Desert.* P. 58.
[2] *Ibid.* P. 57.

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16

What About the Woolly Mammoth?

A number of large, dark shapes emerge from the mists.

THE ARCTIC SUMMER of long ago is nearly over in northern Siberia. We are north of the Arctic Circle in the country where the great taiga, or coniferous forest zone, dwindles away and the tundra begins. The Berezovka River nearby flows into the mighty Kolyma, which in turn flows north to the Arctic Ocean many miles away.

Toward the north, among the straggly spruces that rise from the boggy ground, a number of large, dark masses materialize into a herd of shaggy animals—elephants, or to be more specific, woolly mammoths. They pause here and there to browse on the clumps of sage and saxifrage that grow on the hummocky earth, or on the heather and stunted birch.[1]

A big bull moves over to where the river flows, and tests the ground carefully. He sees that the bank is steep and that there are cracks in the soggy ground. Quickly he glides away in his smooth, elephantine gait. The herd follow him away from the water—all except one young bull who curiously approaches the riverbank. He crops a clump of late buttercups that are going to seed and looks over the edge to the waters swirling below. It does look rather dangerous—he must get back. Stuffing the buttercups into his mouth, he turns to go, but just then the earth caves in under his hind quarters and he slides with it part way down the bank.

The young bull curiously approaches the high riverbank and stares at the rushing water.

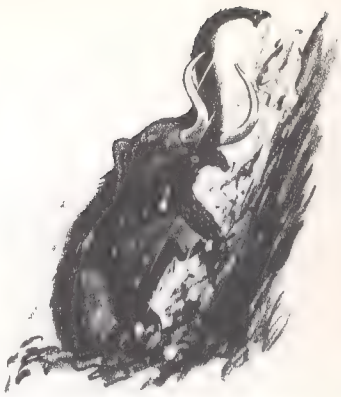
Trumpeting loudly and scrambling in terror, he tries to get back up the bank, but he fails. He succeeds only in pulling more dirt on top of himself and in sinking farther down into the soggy earth till only his head and trunk are free. The herd, hearing him, come back and trumpet in sympathy, but there is nothing they can do to help. Eventually his struggles cease. The herd moves south as darkness approaches and leaves him to his fate.

With the night a chill north wind begins to blow. Then a cold rain soaks the tundra, causing still more mud to slide down on our mammoth. By morning the rain has changed to the first snow of the season, and by the time the sun rises the bleak earth is covered with a white mantle and all signs of the recent tragedy are erased. It is an exceptionally cold fall, and even though most of the first snow melts, it still covers the mammoth's grave on the south bank of the Berezovka where it is sheltered from the slanting rays of the sun. When the fall frosts come the carcass, partly pickled by the acids of the boggy soil, becomes rigid and remains congealed through the long arctic winter, well preserved in the frozen ground.

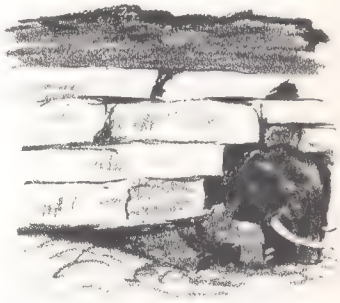
Most of Siberia's rivers flow north to the Arctic Ocean from the southern forests and plains. The spring thaws begin sooner in the southern portions of the rivers than in the northern. This means that the rivers may be in flood in the south but still have four or five feet of ice from bank to bank in the north. The flood water has to get through this barrier, and so it lifts the ice and carries and shoves it forward, forming large ice jams. This results in flooding and in the cutting of new channels. Eventually the jams break and the dammed-up water rushes with great violence to the sea.

In the case of the Berezovka River an ice jam apparently formed just below where the mammoth lay, and large pieces of ice were shoved against him, breaking a front leg, a hip bone, and some ribs. Then as the waters rose silt was deposited on top of the pieces of ice. The river eventually broke out to one side and flowed on the far side of the valley, leaving the mammoth undisturbed for centuries. He was not in the permafrost area, but the mass of ice around him remained frozen, because it was covered with earth and moss. When part of the ice did melt a little in the warmth of summer, the bog acids seeped in and helped preserve him.

In the middle of August in the year 1900 a Lamut hunter named Semen Tarabykin was hunting moose across the scrub land near the Berezovka. His dog was following a trail when suddenly it stopped, nose in air. It left the trail and headed for the river. The hunter followed and soon saw the head of an elephant and one tusk protruding from the ground. He knew what it was. Tusks had been found before, and he knew they could be traded for goods. There was a superstition among the Lamuts, however, that bad luck and disease would haunt anyone who removed a tusk from the head of a mamont, as they called the buried elephants.[2]



Just then the earth caves in under him, and he slides down with it.



Large pieces of ice were shoved against and over him.

The hunter saw part of the decayed head of a mammoth protruding from the ground. He knew what it was.

The dismembered carcass of the mammoth was transported part of the way back to St. Petersburg by reindeer sled.

The molars of 200 mammoths have been dredged from the Dogger Bank in the North Sea.

Early men in Northern Europe trapped and killed the mammoths.

So Semen returned to the tent he shared with two other hunters and told them of his find. Talking it over that night, they decided that they would risk the bad luck. Next morning the three of them returned to the mammoth. One tusk had already disappeared; so had the trunk and part of the top of the head. Wolves had found the carcass even before the hunter's dog had. The mammoth had evidently been partly uncovered when the channel of the river returned to its former course and had undercut the bank again. Spring floods had also eroded the silt above it. Wrenching the remaining tusk loose, the men returned to their village with it.

When the dealer in furs and ivory, a Cossack named Yavlovsky, heard of the find he sent word to the district commissioner, asking him to inform the Academy of Sciences in St. Petersburg, because he knew they were interested in a well-preserved mammoth specimen. By the time an expedition was organized and able to get to Berezovka in September, 1901, landslides had torn the hind quarters of the mammoth from the rest of the body and wolves had done more damage. Winter was coming on, but by means of hard work and by building a shelter over the body the scientists were able to rescue most of the carcass and transport it back to St. Petersburg. Here they mounted it in approximately the same position in which they found it.[3]

This was not the first mammoth that had been found, but it was probably the best-preserved one. Altogether more than 30 carcasses (bodies with meat and skin on them) have been discovered, but most of them were only partially preserved. On the other hand, skeletons and bones have been found in large numbers—during the period between 1700 and 1900 the bones of about 6,000 mammoths have been found in Europe and Asia. In one small area in Czechoslovakia the bones of 600 have been dug up. Whether the animals perished in a blizzard or were trapped by men over a long period of time we do not know.

The molars of more than 200 mammoths have been dredged up with oysters from the Dogger Bank in the North Sea. They may have drowned there when that part of Europe became covered with water after the continental glaciers melted. The total number of tusks found in Siberia and Europe represents about 50,000 animals. Even if these figures are a little generous, we still get the impression that the woolly mammoths must have been very plentiful at one time in the not too far distant past.[4]

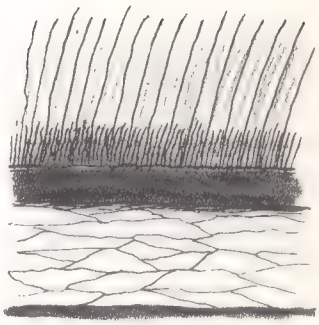
We also have evidence that man living in Northern Europe trapped mammoths in covered pits and killed them with large rocks and spears. They may also have driven them over cliffs or into bogs. These men ate the meat, kept their fires going with the oil that oozed from the broken bones, and carved images from the ivory of the tusks. They used the large bones, skulls, and tusks to hold down the edges of their tentlike shelters, and covered the tops with the skins. When they buried their dead in shallow graves they sometimes covered them with the large mammoth shoulder blades to keep other wild animals from digging them out. The cave dwellers also drew pictures of the mammoths on the walls, so we know fairly well how they appeared.

From all the preserved relics of the woolly mammoths, scientists have discovered many interesting facts. They found that they were not, as some had supposed, southern elephants washed northward by flooding rivers, but that they were northern animals well adapted to cold climates. Under their long, brown hair, which ranged in length from four inches over most of the body to 18 inches on the underside, there was an inch of fine underfur. The skin was also an inch thick and had under it three inches of white fat. They were as well insulated from the cold as are musk oxen.

On the Berezovka mammoth, as well as on some of the others, the red meat appeared to be well preserved. The dogs and some of the natives ate it, but because of the terrible stench none of the scientists was able to steel himself to sample it. Examination of the blood showed the mammoth to be more closely related to the Indian than to the African elephant. The forage in the animal's mouth and stomach was identifiable and included many of the plants still growing in the area. It was helpful in reconstructing the details of the mammoth's death.

The trunk of the Berezovka mammoth was missing, but from others found intact we know that the tip had a finger on the top and a well-defined spatula below. The African elephant has a finger above and another below; the Indian has a finger above but none below.

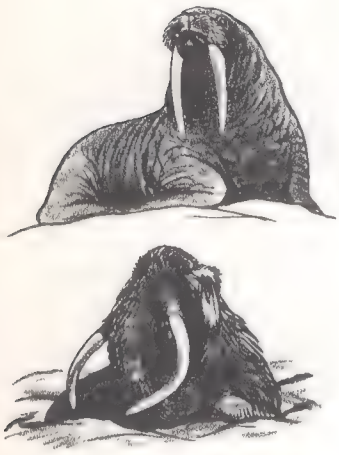
The mammoth was not really a polar animal like the polar bear. It migrated north in the summer and south again in fall as do the caribou. Apparently it stored fat in two humps, one on the head and one on the shoulders. From the fact that many of the tusks were found to be worn on the bottom curve we conclude that they may have been used in winter to sweep



From the preserved carcasses found, we know that under the long brown hair and thick underfur there was skin an inch thick, and three inches of white fat.

The trunk of the woolly mammoth had a finger above and a spatula below.

Tusks worn at the bottom seemed to indicate that the mammoths used them for shoveling snow.



It is somewhat understandable that the Lamuts should confuse the buried mammoths with the living walrus.

snow from the grass to find fodder.

In size the mammoth was a little smaller than the common circus elephant from India, but it was stockier and probably weighed more. Some of the mammoths of the steppes farther south were taller and had long, sweeping tusks. The name mammoth, however, has nothing to do with size. It is derived from the Lamut word *mamont* or *maman,* of unknown meaning, though thought by some to mean "burrowing." The Lamuts believed that the walruses and mammoths were the same kind of animal except that the mammoths burrowed in the ground. When they burrowed up and saw light they died. To them this explained the strange circumstances of their appearance very satisfactorily.

The woolly mammoth was circumpolar in distribution; quite a few have been washed out of the soil in hydraulic mining operations in Alaska. A young one was found fairly well preserved. It was put into a freezer and shipped to the Museum of Natural History in New York City.

Today we have only the African and the Indian elephants with a few subspecies of each, but in the past there were a number of others roaming the world. The mastodon of temperate North America and Siberia was also hairy like the mammoth. It was a long, low-slung animal, without the high shoulders and head of its contemporaries. The tusks of the mastodon were inclined to be short and straight; it lived more by browsing on shrubs and trees in its swampy habitats than by grazing.

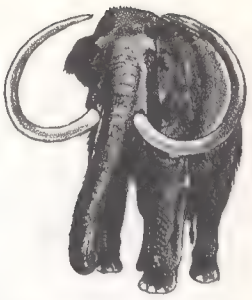
Of the many different types of prehistoric elephant the four above show interesting trunk and tusk developments.

Other interesting types included the *Gomphotherium,* which had two short tusks from the upper jaw curving down and a pair from the lower jaw curving up, with a short trunk between. Most unusual perhaps were the *Amebelodon* and the *Platybelodon,* both of which had the lower tusks elongated and flattened to form a large shovel with which to root in the ground. The short trunk formed the upper lip that covered the shovel. Short upper tusks pointed down on either side of the shovel as though to keep it in place.

One of the very largest of the prehistoric elephants was the imperial mammoth of the American Southwest. It stood 14 feet high at the shoulder and had long, curved tusks. Living in a southerly habitat, it did not need as long and woolly a coat as some of its relatives, but it did have some hair. Excellent skeletons have been dug from the La Brea tar pits near Los Angeles, California, and mounted ones can be seen in the museum there. These mammoths appear to have been in

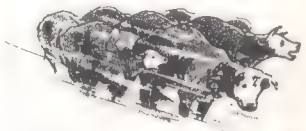
existence when the Indians came to America, and were contemporary with them.

In view of all this, one question persists: "Why did these elephants all die out?" All evidence indicates that mammoths must once have been numerous and widely distributed. The specimens preserved are only the few that happened to be buried in peat, ice, tar, or salt bogs. By far the large majority must have died in places where the flesh would rot and the bones decay and be eaten by rodents, as is the case with animals that die today. They are all gone now except for our two living species. Why?



The imperial mammoth of our Southwestern States, at fourteen feet high, is the largest of them all. It also had some of the largest sweeping tusks.

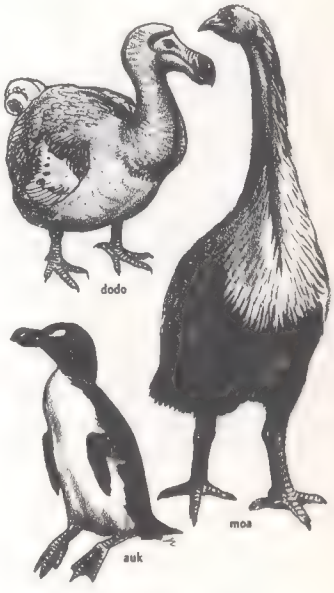
Many may have died as a result of the climatic changes at the time of the ice age. We notice today that, during a heavy blizzard or a prolonged cold spell or heavy snow, thousands of cattle and sheep may die in spite of precautions taken by ranchers to prevent such losses. The blizzards and cold spells that accompanied the continental ice must have been far more severe than anything we have now and it is quite possible that many elephants died at that time. It was not the cold so much as the lack of food, since it was all buried in snow.



Thousands of cattle can die in a severe "norther."

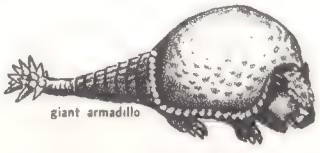
Winter is always a lean time for wild animals. The southern species may not have been as drastically affected as the more northern ones, yet when we recall how severe and sudden a "norther" can be in Texas and how many cattle can meet death abruptly in such an event, it seems possible that the effect may have been felt strongly even in the South. With so much water tied up in glaciers there may also have been some dry summers.

We have reconstructed the events in the death of the Berezovka mammoth at the beginning of the chapter from the evidence available. But there were many other ways in which these animals met their deaths. Some were probably caught in floods and washed away, some in quicksands. Wandering herds may have drowned while crossing rivers, unable to climb the far bank. Buffalo died by hundreds when stampeded over cliffs or into a river, and mammoths may have been trapped in similar ways. It is possible that some of these beasts lived before the Flood and were drowned at that time, but available evidence indicates that they roamed the earth far more recently than that.



Since the Flood it has usually been the largest species of a kind that have become extinct: the giant armadillo, dodo, moa, great auk, giant sloth, giant hog, and many others.

When we consider all the animals and birds that have become extinct in historic times it is not so unusual that the mammoths should do so. Many of those that are gone have been giant species, such as the giant moa, the great auk, the



dodo and its relatives. Others that are near extinction are also large—the California condor, the whooping crane, the blue whale, and many large animals that survive only because they are now protected. There are also a number of giant animals that became extinct about the same time as the mammoths. Some of them are the giant ground sloth, giant armadillo, giant hog, and the giant ox, among American species.

When animals and birds become too big they find it hard to get a constant food supply. Then, during the dry seasons or in winter they can easily starve, especially those that live in herds. The smaller, more efficient creatures find ways of surviving, but the larger ones are often adapted to eat one plentiful kind of food—when it fails they are lost. There is evidence that during the time of the continental glaciers many of the more northern animals migrated south and crowded the ones there, with the result that there was not food enough for all.

Some have thought that the woolly mammoths were killed by the ice sheets that covered their area. It is interesting to note, however, that the places where most of them have been found were not covered by ice. Those found buried were not in the permafrost, but in the edge of the forest region and on oceanic islands or farther south in Europe.

Curiously, the finds of mammoth carcasses, distinct from skeletons, have not been in places that had been covered by continental ice.

The extinct elephants probably had few enemies that were able to harm them, but on the other hand they probably did not multiply fast and would need to have favorable climatic and food conditions in order to increase. Modern elephants have no more than one young every two years; in times of famine and distress there often are none. The young mature slowly and are between 15 and 20 years old before they begin to reproduce.

All these factors make it reasonable to expect that it would not take a world deluge to destroy the several kinds of elephants that lived in the past and are no longer with us.

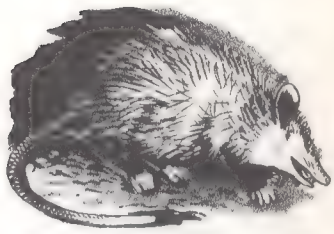
[1] Josef Augusta. 1962. *A Book of Mammoths.* Paul Hamlyn, Ltd., London. Pp. 7, 8.
[2] Willy Ley. 1951. *Dragons in Amber.* P. 99.
[3] ———. *Ibid.* P. 113.
[4] ———. *Ibid.* Pp. 121, 122.

For Further Reading

Coffin, Harold G. 1969. *Creation—Accident or Design?* Chapter 19.
Ritland, Richard M. 1970. *Meaning in Nature.* Chapters 16, 17.

17

When Were the Fossils Formed?

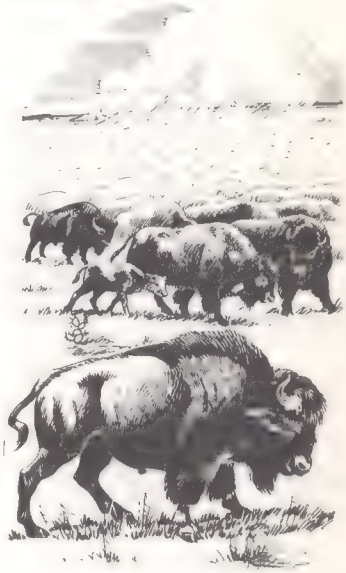


An opossum is struck by a car and lies dead at the side of the road. Does it turn into a fossil?

AFTER HEARING OF the woolly mammoths and other prehistoric elephants and discovering that these mammals were not all buried by the Flood but lived and died some time later, the reader may have at least two questions to ask. First, "Why do some animals and plants fossilize while others do not?" Second, "How can we tell which fossils date from before the Flood and which after?" Let us examine the problems.

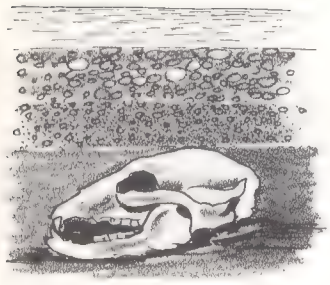
An opossum is hit by a car at night and lies at the edge of the road. During the day crows and jays peck at the carcass; later, rats and foxes finish up the remains. A smaller animal might be completely buried and eaten by sexton beetles. On a larger animal the heavy bones would not be crushed. But rodents would eventually gnaw them to pieces for the minerals they contain.

When the American plains were first discovered they were black with immense herds of bison. Within a century almost all were killed. Where are the remains? Of course wagon-loads of bones were collected and ground up for fertilizer, but even when no bones were collected they are now very rare. I have found portions of skulls in the edges of ponds, partly buried; I also saw one hanging on a barbed-wire fence. After a bush fire had burned the leaves and covering brush in a prairie wood, I found the skeletons of three buffaloes in the ashes. But on the whole there are very few left—they have not fossilized.



The American plains were once covered with herds of bison. After a little more than a century only a few skulls remain.

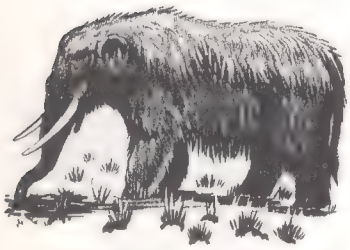
Fossils form only when the remains can be kept from the natural processes of decay in some way or other. Animals that are buried by a flood under silt and water oxidize slowly, and the bones are usually preserved even if the flesh is not. Most pre-Flood and many post-Flood fossils have been formed this way. Animals may be buried as was the mammoth in a bog or



Bones buried in silt are likely to be preserved even if the flesh is not.

quicksand. This shuts off air, and the bones are protected from rodents. Salt bogs also preserve animals buried in them, as the following story illustrates.

A group of early explorers in Kentucky found shelter from a sudden shower by sitting under a blanket stretched over the rib cage of a mammoth. When the rain was over they built a campfire outside and sat around it on the vertebrae of other mammoths they found lying around. They boiled their meat for supper in salt water from a spring nearby. As they looked around and saw large bones lying everywhere, they named the place Big Bone Lick. This turned out to be one of the greatest natural depositories of prehistoric or fossil bones in America. Parts of the skeletons of more than 100 mammoths and mastodons were found in this small area. The animals had evidently come there to lick the salty blue clay, had become mired in the quaking bog, and perished. Then they were partially preserved in the brine.[1]



Mastodons evidently came to the bog to lick salt and were caught.

When first discovered in 1739 the bones were plentiful above ground, but people soon began carrying them off. One collector gathered a boatload, was captured by the Algonquin Indians, lost his bones, and barely escaped with his life. The boat of another collector capsized as it was heading upstream, and the cargo sank to the bottom. Still another managed to return to civilization with a goodly collection, only to have an ignorant but industrious servant grind them up for fertilizer in his absence.[2]

In 1939 four small boys wandered onto the dry surface of a pool of asphalt that had been discharged from a coke furnace near Mount Pleasant, Michigan. The first boy began to sink, and as the two others tried to help him they also became trapped in the sticky tar. The fourth boy ran for help, and the three were eventually rescued, but not till the first one had sunk to his neck in the tar.

The four boys began to walk on the dry surface of a pool of asphalt.

Animals can also be trapped like this. At La Brea, near Los Angeles, is a natural tar pit where thousands of animals ranging in size from imperial mammoths to ground squirrels have lost their lives in the past few thousand years. Saber-tooth tigers, giant sloths, dire wolves, giant prehistoric condors, and many other creatures, including some from the present era, have been recovered from these pits as the tar has been removed for commercial purposes.

When seeking shelter in caves animals may fall into pits in the dark. Their bones are often pickled by the mineral-impregnated water that drips onto them from the ceiling. In

dry caves where there is no weathering and no moisture to assist in decay, matter may lie for ages without much change. In a cave of this kind in the Lake Mead area of Nevada part of the floor is covered with the dung and bones of long-extinct ground sloths. The cave is so dry that portions of skin and hair of the sloths are still attached to the bones.[3]

Early men sometimes lived in caves—their bones, artifacts, and pictures are preserved in different parts of the world. Some European caves are real art galleries. The remains of cave bears, hyenas, and other animals have also been found there.

When volcanic ash covers plants or animals, as noted in a previous chapter, they may be preserved, sometimes in the minutest detail. Windblown sand or dust may cover organisms for ages, and of course sediments on the ocean floor also preserve creatures quickly buried in them. Trees buried in ash under water are quite likely to become petrified, or turned to stone.

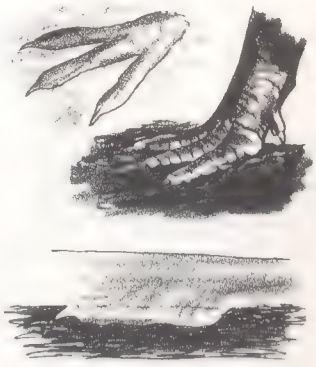
The word *fossil* may refer to different kinds of preserved matter. In some cases, as in petrification, the original tissues may be replaced by calcium or silicon salts under water. At other times the original bone or shell remains. Tracks may be termed fossils even though they may merely indicate the presence of some animal in the past. Sometimes there is found the imprint of the foot in clay or sand that has hardened into rock. At other times the print had filled with sediment that has hardened, and we have the cast instead.

This is the case when dinosaur tracks are found in the ceilings of coal mines. In such cases the dinosaur walked over a mass of decaying vegetation in water, leaving tracks. Flooding waters filled the tracks with silt, then heavier layers of gravel and rocks covered this, sometimes with many strata, as could easily have happened during the Flood. More vegetation also washed in to make additional layers of coal. The silt in the tracks hardened under pressure, the vegetation changed to coal; and when the miner, thousands of years later, removed the coal from beneath, the light-colored clay in the tracks showed up plainly.

Now back to our second question. How can we tell which of the many fossils date from before the Flood, and which after? We have seen that during and after the Flood many changes took place on the surface of the earth. Also, we have noted that its waters buried most of the pre-Flood life under many layers of earth and rock. These layers are called sedi-

Thousands of animals and birds, from mammoths and condors to ground squirrels, became buried in the La Brea tar pits, near Los Angeles.

Leaf specimens have been preserved in minute detail in volcanic-ash deposits.



A pre-Flood dinosaur leaves his imprint in decaying vegetation. It fills with silt, which turns to stone, and is preserved to be found later in the ceiling of a coal mine.

mentary because they were deposited as sediments that settled out of the roiled water. The igneous, or molten, rock is the bedrock of the earth. In it we would not expect to find fossils.

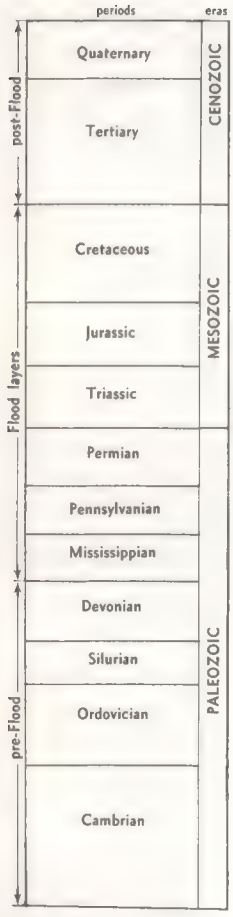
Basically the fossils of pre-Flood animals and plants would be buried in Flood-deposited layers. This, in general, means the strata below the Cenozoic in the geologists' time chart. There is the possibility that some fossils may have been eroded from one era to another, but in such cases there is usually other evidence to show that this has happened.

Most of us, however, are not geologists and cannot readily identify the eras. We need other clues that are more obvious to us. Fortunately there are several. Caves were leached out of sedimentary layers during and after the Flood. For this reason fossils that are found in them must have lived after the Flood unless they form part of the limestone wall of the cave itself. Tar pits are formed in connection with oil deposits, which came as a result of the Flood. Salt bogs are also post-Flood features. Animals trapped in either the tar or the bog must be ones that lived after the Flood. So are ones that have fallen into rock fissures or that are preserved in partly frozen ground.

Most volcanoes erupted during or after the Flood; fossils buried in ash or broken rock are almost sure to be of animals that lived after that event. The same is true of animals buried in wind-blown deposits. Flood deposits can be of recent, as well as Deluge, origin, and we have to be sure that we know whether fossils came from Flood strata or from post-Flood valley fill. Whenever a deposit contains fossils of animals long extinct and also of ones that are still living today we can be fairly sure that they are all of post-Flood origin.

With all these factors in mind we may have to reconsider many of our conceptions regarding fossils. Some people easily class all fossils as having been buried during the Flood, but that certainly is not a valid conclusion. We may also have to revise our ideas of what went into the ark and was preserved alive. It is well to bear in mind, though, that just because an animal has not been found in a pre-Flood deposit does not mean that it did not exist then. It only means that it has not yet been found in those deposits, or that it might not have been buried and fossilized, but may have floated on top of the water and decayed instead.

Listing the species of animals found in pre-Flood deposits and those in post-Flood deposits does, however, show up



Most of the pre-Flood fossils would be found in strata below the Cenozoic Era in the geological column.

ARTIST, JAY MATTERNES

COURTESY THE SMITHSONIAN INSTITUTION

Here prehistoric animals are shown in a forest habitat some time after the Flood. The grotesque *Uintatherium* dominates the scene. Lithe *Eohippus* (early horses) in the foreground and other animals are recognizable as earlier types of those we have today, though some are not entirely convincing as the artist has pictured them from fossil remains.

In this post-Flood river valley we see representative groups of mammals as they may once have lived in America. The *Brontotherium,* with the slingshot on his muzzle, is one of the bulkiest mammals that ever lived. The three-toed *Mesohippus* on the left and the dark-necked early camels, lower center, watch the entertainment provided by a pair of hogs.

ARTIST JAY MATTERNES

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ARTIST JAY MATTERNES

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The clumsy-looking *Moropus,* clawed relative of the horse, on the left, is annoyed at an early type of dog. Small camels, antelopes, and a herd of small horses are typical of ones that might have lived in such a grassland habitat, but the giant hog looks a bit out of place among them. In the distant mud flat several hippos are wallowing. Two rhinos rest under a tree.

This view shows a group of *Amebelodon,* upper left, and giant camels, right and in the distance. In the foreground are some pronghorn relatives, horse types, and peccaries. The carnivore in the lower right is a bearlike dog, *Osteoborus.* Two-horned rodents, *Epigaulus,* startled by running peccaries, are seen at their dens in the left foreground.

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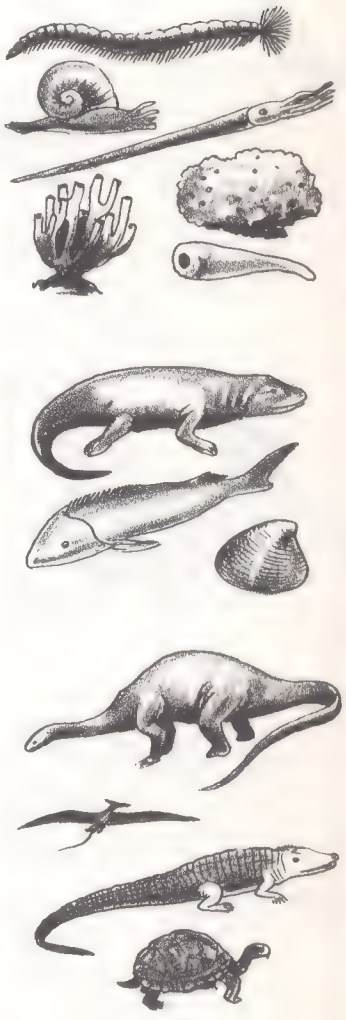
some interesting patterns that cannot be ignored. Here are some of the more important groups:

Among what may be presumed to be pre-Flood fossils there are large numbers of marine invertebrates, sponges, corals, marine worms, shellfish of many kinds, and crabs that were buried in their water habitats. There are some insects such as dragonflies and cockroaches, but most insects would not have preserved very well except in amber, as some were. Bony fishes appear to have been numerous, as were sharks, rays, lungfish, and coelocanths. A number of amphibians have been found, mostly of the salamander type, some of them comparatively large. Reptiles were apparently the dominant species.

Besides the large dinosaurs, there were also many smaller ones, as well as a large number of marine reptiles that lived in the water almost like fish. Few birds have been preserved; notable among those found is the reptile bird, with a long bony tail. There were also several water birds, one ternlike, two loonlike, and another flamingolike. Apparently there were very few mammals. There were some small, mouse-sized insect eaters and also some carnivorous types considerably larger. It is quite possible that there were many more types that were not fossilized, or have not yet been found.

Among the fossils that we could consider to be dated after the Flood there are again numerous marine animals and reptiles, but by far the greatest increase is in the number of birds and mammals. The findings indicate that there were not just large numbers of the few early types, but that there were many different classifications of birds and mammals soon after the Flood. Among mammals there were insect eaters, rodents, hoofed mammals, carnivores, primates, whales, and also the "primitive" monotremes, and marsupials.[4] Why so many classes of mammals should arise suddenly when for ages there had been hardly any is puzzling unless we accept the premise that they were created in the beginning and were present, though in small numbers, and have not yet been found in pre-Flood deposits. The fossil record of mammals presumed to have been buried since the Flood is most impressive in that there have been twice as many species found as are now living. Many of them are very similar to present-day species.

The prehistory of birds parallels that of mammals. Many new classes were present in the post-Flood fossils including birds like the ostriches, pelicans, herons, ducks, fowl-like



Among the pre-Flood fossils are many marine invertebrates, fish, amphibians, reptiles, and some birds and mammals.

One of the earliest birds found in fossil form is the *Archaeopteryx*. It is sometimes called the reptile bird, and had tail feathers pinnately arranged.

Among the early fossils there were also a loonlike bird, and an elephant bird that stood ten feet tall and weighed around 1,000 pounds.

birds, shore birds, hawks, owls, perching birds, and others.[5] It appears very much as though the original kinds of these birds could have been in the ark with Noah.

The positioning of some fossils in stratified rock indicates two chief periods of burial, or "times of great dieing."

The species that became extinct at the first period (mostly marine invertebrates) are ones that accumulated and died before the Flood, and also living animals that were buried by the silt of rising rivers when the heavy rains washed mud and gravel into the seas. After that the vast pre-Flood forests were uprooted and carried down by water to make the layers of coal formerly known as the Carboniferous strata.

Many of the land animals, reptiles, amphibians, and birds floated on the water or escaped for a time to higher ground. Then they also drowned and settled with the mud and silt throughout the succeeding layers, but especially at the upper part of what is called the Mesozoic. That accounts for the second time of crisis because many species, especially of the large reptiles, would be the last to perish.

This is of course an oversimplification, but suggests what might have happened. In actual life there are many irregularities and since there was so much upheaval and disturbance during the Flood, and so much erosion, faulting, uplifting, and other cataclysms after it, it is hard to draw a line and say, "the Flood was here."

[1] Theodore Roosevelt. 1964. *The Winning of the West.* Fawcett Publications, New York. P. 81.
[2] Edwin Way Teale. 1965. *Wandering Through Winter.* Dodd, Mead & Company, New York. P. 242.
[3] Life Nature Library. 1961. *The Desert.* P. 40.
[4] *Ibid.* 1963. *The Mammals.* P. 38.
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18

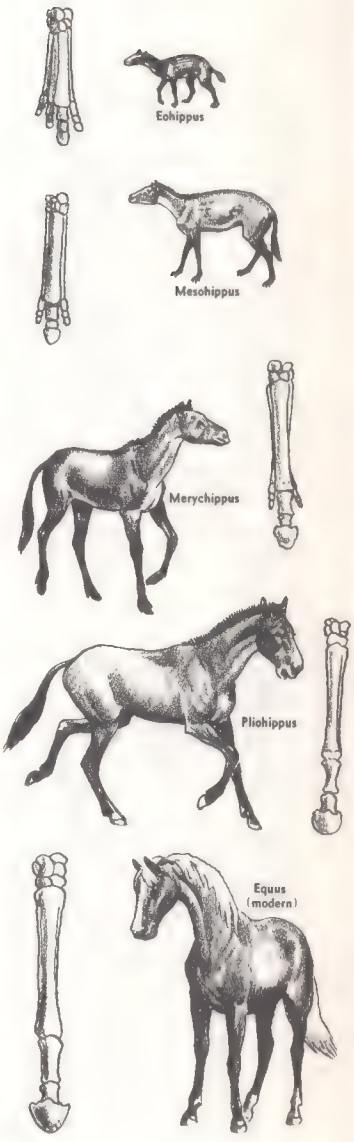
The Dawn Horse and the Honey Creepers

AMONG THE POST-FLOOD fossils discovered in America, more than ten species of horses are represented. They vary greatly in size and appearance. The smallest is not much bigger than a jack rabbit, and the largest is about the size of a saddle pony. Further, the smallest has four toes each on the front feet and three on the hind ones. The next size has just three toes on the front feet; the following one just splints on either side of an enlarged middle toe; the largest had a single hoof like that of our present-day horse. There are also respective differences in the teeth, shape of skull, and brain size.

Of the ten fossil species in America five are usually selected by paleontologists to represent the evolution of the horse from a primitive to a modern type. These have been found in successive geological strata, supporting, evolutionists say, their contention that the smallest horse is the earliest and that the largest is the most recent. They do not specify where the other five species fit into the series, but that is not necessarily important to the hypothesis.

According to the theory, the Western plains were humid and covered with swampy forests during the time of the little "dawn horses," as they have come to be called. It is believed that most mammals began with five toes on each of their feet, but that by the time of the dawn horse its strain had already lost some digits—just why, we are not told. Because the ground was swampy it was an advantage to have spread toes. (Fossil plants seem to indicate the climate was more humid right after the Flood.)

As the country became drier with the rise of the Western mountains and the shutting off of the moisture-laden winds from the sea, the need for the extra toes diminished. Speed



Of the ten fossil horses found in America, five are usually selected to represent the evolution of the horse from the small primitive size to the modern horse.

in traveling over firm ground to escape enemies became important and necessitated running on the tips of the toes. Since the middle toe was the longest and supported most of the weight, it grew and the other two deteriorated.

Adjusting the time element—the geological strata could have been laid after the Flood—this theory of adaptation is a fairly reasonable explanation of the sequence in which the horse might have developed. The process would of course have involved mutations and the elimination of the slower or more unfit as the animals had to adapt to a changed environment. In most cases the ones best fitted survived, but there could also have been other factors entering in that killed off certain species. It is apparently a simple case of adaptation to environment. It is true that the pronghorn, though in a similar environment, did not develop a single hoof but a double one. This also could have been by adaptation if the two middle toes were equally prominent.

There are also many different types of hoof among the cloven-footed animals.

Pigs have long dew claws that could be regarded as additional toes. They spread out to support the animal in muddy ground. The peccary, which lives in dry country, has only one dew claw on each hind leg. The pronghorn and the giraffe have none. Actually there are many kinds of odd- and even-toed animals today and in fossil form.

There is an interesting question, though, that remains unanswered. If the need for speed in dry country produced a single hoof, why does the cheetah, the fastest runner on earth, have five toes on the front feet and four on the hind feet, and a foot with unsheathed claws that is more doglike than any of the other cats?

The *Moeritherium*, remains of which have been found along the Nile River, is supposed to be one of the earliest of the elephants.

To return to our horses, it is possible that the different kinds developed successively. It is also possible that many of them lived at the same time. One may have lived in the swamps along lakes and rivers, another may have preferred the drier uplands, and still another may have found parklands to his liking and may have preferred browsing to grazing.

Horses are great travelers. Early offspring from the original ones on the ark may have gone from Ararat to Asia shortly after the Flood. Differentiation must have taken place soon, and it may be that the small types developed early. They may even have been one of the original kinds. Then there must have been a lot of traveling back and forth between America and Asia, for the Asian horses were much like the larger American. The small dawn horse evidently

did not go back to Asia, at least it has not been found there. Eventually all the horses in America died out, as has been mentioned previously.

Fossil elephants are also arranged in a series to show how they developed from a small tapirlike creature, the remains of which have been found in Egypt near the delta of the Nile. It had neither tusks nor trunk, but suggestions of both. In the next type, found also in North Africa, both trunk and tusks were partially developed. From there the steps are not too clear or consecutive, but range through the various mastodons and mammoths that once lived in the Old and New Worlds, to the elephants of today.

There is evidence to show that many of these different types lived at the same time even in the same countries. There is also a possibility that there is a line of descent through which elephants changed to suit the different environments in which they found themselves. This again is adaptation to environment rather than evolution from a simple creature to a complex one.

Many different types of kangaroo live in Australia today. For a moment suppose they were all to become extinct. Suppose further that in due course paleontologists discovered skeletons of all the different types along with those that are already extinct. What a convincing series they would make! They could "prove" that the kangaroo tribe began with the tiny rat kangaroos, developed after a long period of time into tree kangaroos, then because the country became dry and forests disappeared, they all changed to hare wallabies. In time they changed to rock wallabies, then to the smaller kangaroos, to the big gray, and finally to the giant kangaroo—which has been extinct for ages!

Even though some of these series, like those of the horse or the elephant, seem very convincing and doubtless show some relationships, we must not take the arguments at face value. In many cases they may only show divergence from a base type to ones that fit varied habitats.

All this change need not take millions of years. Look at the great variety of dogs we have today. Most of them were developed in historic times in widely separated countries, in varied climates, and for many different purposes. The big St. Bernard and the tiny Chihuahua, the woolly English sheep dog and the Mexican hairless, the dachshund and the whippet—all are dogs. Some were developed by man for work, some for the chase, some for going down badger bur-

Present-day kangaroos could be arranged in a convincing series to prove that the giant fossil type, which has been extinct for centuries, developed from the mouse kangaroo.

In less than a century farmers have brought into being, by controlled breeding of cattle, cubical beef producers and also heavy milk producers.

rows, and others for lap dogs. In some cases the dogs developed naturally into distinct types, at other times they were bred to bring out certain desirable qualities. No one mistakes them for anything but dogs, and no one denies that they are closely related to the wolves, foxes, and jackals. They all interbreed. It is easy to see that they could all have come from an original pair of ancestors that were saved from the Flood in Noah's ark. Yet what a variety!

Cattle such as the Hereford and the Angus have been bred to be cubical beef producers. Others, as the Holstein, Guernsey, and Jersey, have been bred to be milk machines. Some, such as the shorthorn and the brown Swiss, were developed as dual-purpose animals, for both milk and meat. These are examples of man's manipulation of species to bring out certain desirable qualities, but Nature is often just as rigid and ruthless as man in destroying the unfit and preserving for breeding only those that meet certain requirements. Some fish lay thousands of eggs, but only a few develop to be mature fish. Many are weeded out as unfit; only the best-adapted ones survive.

The variety of domestic dogs, though all one species, today ranges from the St. Bernard to the Chihuahua.

Centuries ago there came to the Hawaiian Islands from the American coast a pair or more of honey creeper-like birds. They found the climate ideal and flowers plentiful, so they multiplied rapidly and soon spread throughout all the islands. Because some of the islands were widely separated, the birds did not fly from one to the other very often, and the bird immigrants on each island soon became distinct from those on other islands. Further, because there were few other species of birds, the honey creepers tended to occupy the niches of birds that were absent.

Typically, the honey creeper today has a long curved bill

From parent stock that arrived in the Hawaiian Islands long ago, many honey creepers have evolved that vary greatly in habits and appearance.

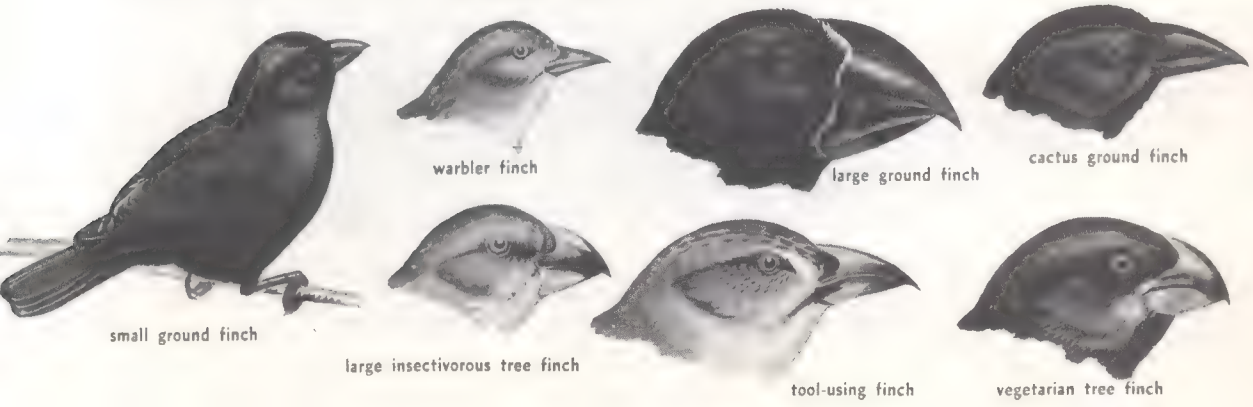
and gets honey and insects out of tubular flowers. Unlike the hummingbird, it creeps along the branches to get to the flowers instead of hovering in front of them. A number of the Hawaiian honey creepers fit this pattern, but there are wide differences. They range in color from black to red and yellow. Some of the birds are small, have small slender bills, and are insect eaters similar to our warblers. One has a heavy, hooked parrot-type bill. Four of them have heavy seed-cracking bills such as our finches or grosbeaks. One fills the niche of a woodpecker, since there are none on the islands. In the case of these birds there is evidence not only of diverging but also of crossing back of some species that had become quite different.

Another example that has become a classic because it was mentioned by Charles Darwin in his book *The Voyage of the Beagle* is that of the finches of the Galápagos Islands. Evidently a small group of South American finches found its way to the islands long ago, multiplied there, and developed into birds of varying habits and appearance, filling the biological niches of several other birds that were absent from that part of the world. As a result, there are now warbler finches, seed-eating finches, insect-eating finches, and even a tool-using woodpecker finch that uses a cactus spine to spear grubs out of holes.

Islands are always interesting localities in which to study the process of adaptation. Animal and bird life is usually quite limited, and there are always a number of empty niches to be filled.

If swallows were the only birds to arrive at an isolated island the flying insects would soon be kept under control. Sooner or later this prey might become scarce; then some swallows would find that insects were far more numerous on the ground and more easily caught. Conceivably these birds

Darwin's famous finches on the Galápagos Islands also show great differentiation, but they are still finches; none have changed to mockingbirds.



might be inclined to change their eating habits; they would also change in other ways to adapt to their new way of life. Other swallows might find that seeds were easily found; then they might become vegetarians. Among the seed-eaters the ones with the heaviest and strongest bills would survive in time of famine, so we would have swallows with sparrowlike bills. The process of adaptation would, again, depend on mutation within the kind.

Australia was possibly first settled by marsupials when the animals migrated outward from the ark. Apparently a few other kinds reached there, but not many. Possibly all marsupials were at first omnivorous, as is the opossum, eating all kinds of food. Then the kangaroos, koalas, and some of the others became vegetarians; the Tasmanian wolf, and a few besides, became carnivorous, eating mostly meat. Some of the marsupials developed like rabbits, some like mice, some like squirrels; one even became quite similar to the mole in appearance and habits. There was evidently no ancestral form from which variations of the deer or cattle type could derive, but the big kangaroos took their place by grazing in the fields. There is a marsupial cat that is a good hunter, and the Tasmanian devil could be compared to the wolverine. The Australian banded anteater is also a marsupial.

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Some birds such as the jay are adaptable and have changed into many species. Others such as the killdeer are the same over the whole country.

19

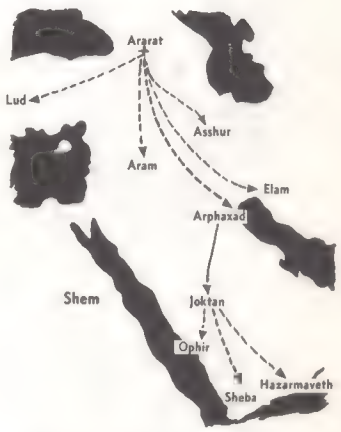
How Noah's World Was Settled

AFTER NOAH AND his family came out of the ark they moved down to the warmer valleys and settled there. They probably built houses, kept stock, farmed—and we know Noah planted a vineyard. These were all things they had done before the Flood, and naturally they continued doing them after the violent year-long interlude. As the children of the three sons grew up they naturally moved away from the family homes and found choice land for themselves.

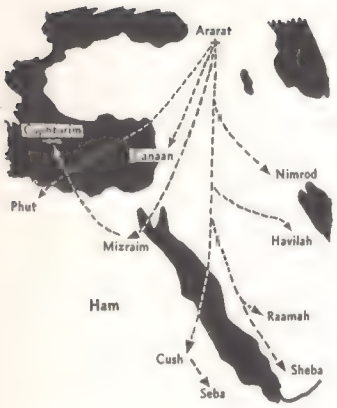
It would be interesting to follow the various descendants of Noah and see just where each of the sons, grandsons, and great-grandsons settled and what peoples they founded. Scholars have tried, working from the Bible, archeology, and recorded history, to re-create a picture of what took place, but they have found this web of life very tangled and interwoven.

Some branches of the family became important empires and are easily traced. Some died out or became mingled with other families and lost their identity. Place names have changed since Biblical times, and it is difficult to correlate them to modern maps. Some tribes moved after settling in one area, or in some cases, were driven out by more aggressive neighbors. On the other hand, quite a number of peoples, such as the Canaanites, the Sidonians, the Jebusites, and the Amorites, are usually referred to by the names of their ancestors in the Scriptures, and their lineages are more easily followed. There are also terms such as "the children of Israel" or "the children of Heth" that clearly identify the progenitor.

The accompanying chart, amplified from *The SDA Bible Commentary,* provides some items of interest. Note that Peleg and Joktan, Shem's great-great-grandsons, became founders of the Israelite and some of the Arab nations.



Shem's descendants moved south from Ararat as far as what is today known as Yemen. Peleg and Joktan, we are told, lived at the time when the earth was divided. Was this the time of continental drift?



We see that the descendants of Ham also spread into much the same area, but some of them went into Africa and Egypt.

Most of the descendants of Japheth turned northward from Ararat to populate some of the European countries.

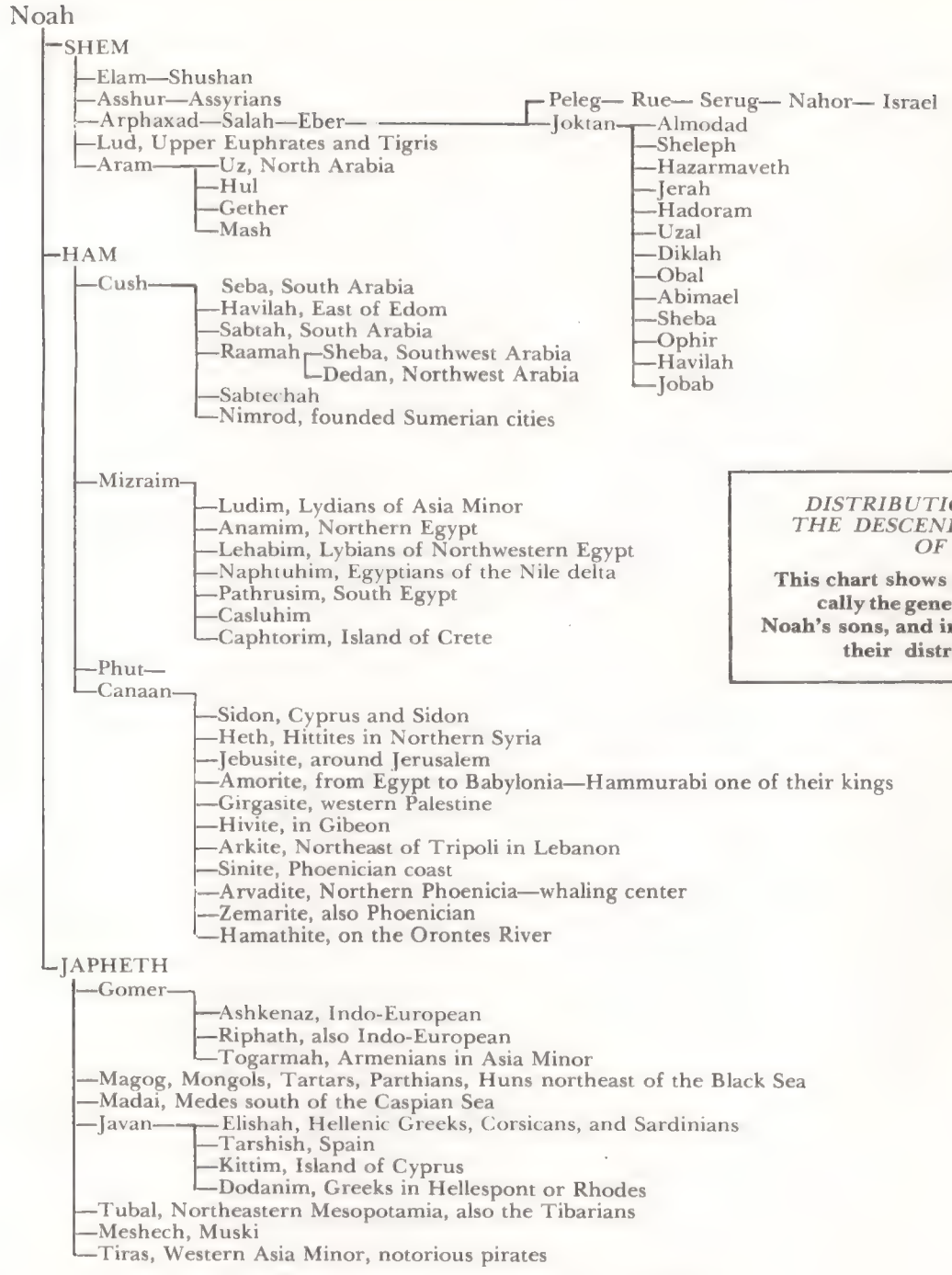
Ham's grandson, Nimrod, a mighty hunter, founded the first city states by building Babel, Erech, Accad, and Calneh, in the land of Shinar, along the lower Euphrates River. He is the first to be mentioned as changing from a patriarchal to a monarchal system of government. There were soon many other kings, but some of them were no more than chiefs of small tribes. Abraham was able, with his 318 servants, to defeat four kings and rescue the property and the prisoners they had taken, which included five kings and his nephew Lot.

At first Abraham lived in Ur of the Chaldees, adjacent to the Plain of Shinar, Nimrod's territory. Thus we see that at first some of the descendants of Shem and Ham lived quite close together. As their numbers increased they wandered farther apart. Abraham's journey to Canaan (and later to Egypt), while divinely ordained, was typical of the wanderings of these early people as they searched for a country that suited them and that they could call their own. The fact that Abraham lived for many years with his large flocks in the country of the children of Heth, and of the Jebusites, indicates that the land was at that time still quite empty. When Lot chose to go to the well-watered plain of the Jordan, it also must have been almost without inhabitants to dispute his right to it.

There is no evidence of any difference in skin color among the early descendants of Shem, Ham, and Japheth. Color and other differences evidently developed only later as tribes isolated themselves by distance from the rest.

In Genesis 36, and also in 1 Chronicles 1, we are given an account of the descendants of Esau. It seems not to have any direct bearing on the story of God's people, but it does give a picture of this family spreading out into an empty land, occupying it, and founding tribes. The dukes are listed with their most illustrious sons, and one gets the impression when reading this early history that these people knew that they were among the founding fathers of the earth. They regarded their genealogies as very important and wanted all who came after them to know who was born first and how he was related to Noah and to Adam.

The descendants of Japheth's son Gomer wandered north into Europe. Later some of them came back south, perhaps because of the continental glaciers, and drove out some of the tribes in Asia Minor. Some of these tribes were ancestors of the Armenians. Tubal and Meshech settled north of the



DISTRIBUTION OF THE DESCENDANTS OF NOAH

This chart shows graphically the genealogy of Noah's sons, and indicates their distribution.

(Amplified from *The SDA Bible Commentary,* vol. 1, pp. 270-282.)

Nimrod built his cities near the mouth of the Euphrates River. His descendants, called the Sumerians, are the earliest ones referred to by archeologists as civilized.

Abraham was called by God to leave his home near the Sumerians and found a new nation in an uninhabited land that God would show him.

Black Sea in areas now occupied by the Russian Nation. Still another branch, that of Magog, crossed the steppes to the east. From them grew the powerful Mongol, Tartar, and Hun tribes that came back later to ravage the more civilized eastern nations.

Nimrod's city dwellers around the mouths of the Tigris and Euphrates rivers were known as the Sumerians. Archeologists agree with the Biblical account that they were probably the first to develop a complex urban civilization. Living in a city does not necessarily civilize one in every sense of the word, but it does add a degree of sophistication. Since these people were in a rich land and lived in permanent homes, they could accumulate possessions, perfect crafts, store foods, and live in comparative luxury. They also perpetuated many of the sins of their pre-Flood ancestors, forgot God, and worshiped idols.

Because Abraham was faithful to God, he was called to leave this heathen environment and found a nation that would serve the Lord. He became a nomad, dwelt in tents, and traveled slowly with his big herds. Abraham was a wealthy man, but his property was in cattle, sheep, camels, and asses rather than in houses and lands. As real property he owned only the Cave of Macphelah, which he bought.

We are familiar with his story as told in the Scriptures, but sometimes wonder what happened to some of the other people who lived on earth during his time. The nations around the Mediterranean were either trading with one another or fighting. With the continual travel, intermarrying, taking of slaves, or transplanting of populations, there was little tendency for them to develop strong national characteristics. Rather, distinctive traits tended to be graded down as the mixing continued. When the great world kingdoms arose later, this mixing extended to the Greek and Roman peoples, since their soldiers were stationed all over the then-known world and intermarried with the local people.

On the other hand, tribes of people that went far south into Africa, or to China, or to India, became separated from the others by distance, deserts, and oceans. They eventually became distinct from their ancestors. As they married only within their own neighboring tribes, any distinctive characteristics that might appear (such as a flat nose, curly or straight hair, or a different color of skin) would become more and more pronounced with each succeeding generation and would soon be recognized as a national trait. In tropical coun-

tries a heavily pigmented skin to shield from ultra-violet rays is an advantage that would tend to be perpetuated.[1] In this way many different types of people around the world originated. Some were tall, fair-haired, bearded, and blue-eyed; others were short and squat. Some had slit eyes and sparse hair, others had long hair covering even much of their bodies.

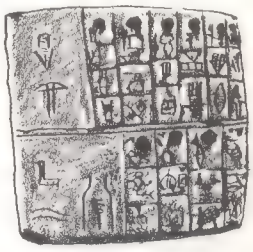
The Bible and archeology tell us something of what the world was like at the time of Abraham. He was born just two years after the death of Noah; and his father, Terah, lived for 128 years during the lifetime of the noted patriarch. Much of the skills and knowledge of the antediluvians—illustrated in building and provisioning the ark—could have been passed on to the people of Abraham's time by Noah and his sons.

We know that the Sumerians and most of the other nations of that area had two-wheeled carts for transportation, with oxen to pull them. They also tamed onagers, or wild asses, and drove them in chariots. In addition they had a number of other domestic animals. They knew how to smelt copper, tin, gold, silver, and iron from the ores. They could also, by mixing copper and tin, make bronze, an alloy harder than either of its components. From these metals they were able to make jewelry, utensils, idols, spears, swords, and armor. Metalworking became an important industry among them; to get the ore, and also to dispose of the various manufactured articles, they traded with the surrounding nations. Barley, copper, silver, and gold served as money—coins came later.[2]

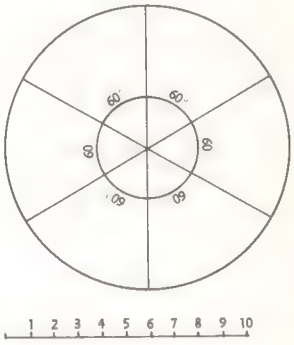
Trade made writing necessary, so the cuneiform alphabet was invented. Notes were written on damp clay tablets, many of which exist today. The Sumerians used numbers by tens and also by sixties. The tens gave us the decimal system, and the sixties divided the angles of the radii of a circle evenly, giving us 360 degrees. This supplied the early astronomers and mathematicians with the means by which they computed very accurate calendars and predicted eclipses.

At about the time of the Sumerian civilization there were built on the banks of the Indus River, in what is now Pakistan, a number of large, well-laid-out cities. They could have housed 20,000 to 50,000 people each in buildings of sun-dried brick, with a raised citadel in the center of the city. Among the artifacts found in them were toys, jewelry, figurines, and bronze tools and weapons. In Egypt, on the Nile River, there also rose a civilization with great cities, imposing

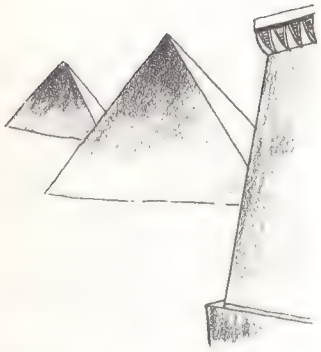
The Sumerians knew how to smelt copper, tin, gold, silver, and later also iron.



When writing was invented, notes were written on damp clay. Some of these remain today and give us an idea of how people lived then.



The Sumerians used numbers by 10's for counting and by 60's for equally dividing the radii of circles into degrees.



How could a Stone Age savage suddenly be capable of building pyramids such as those in Egypt?

homes, and massive tombs. Impressive feats of engineering were performed in the building of their pyramids and temples.[3]

All around the Mediterranean nations sprang up. The Phoenicians were great craftsmen and traders. Their shipyards turned out sturdy boats that sailed all over the Mediterranean Sea and out past Gibraltar to the west coast of Spain and even to Britain. Herodotus says they sailed around Africa, and today there is some evidence suggesting that they may have visited Brazil and left inscriptions there.

The Assyrians built a great empire by conquering surrounding nations. They had their capitol at Nineveh on the banks of the upper Tigris River, not far from the mountains of Ararat. On the Island of Crete the Minoans built a kingdom with magnificent palaces that were twice destroyed by earthquakes. The Greeks later developed a civilization that was notable for its great achievements in art and literature. Only recently archeologists discovered the site of a Greek village on the seaside in Macedonia where farmers raised and stored wheat, barley, and lentils at about the same time as did the Sumerians. In Italy the Etruscans and Romans founded rival city states that eventually merged into the great Roman Empire.

Herodotus says the Phoenicians sailed all the way around Africa in their ships.

It would be odd if all these comparatively sophisticated nations should arise almost simultaneously from a supposedly dim-witted people that had been for millenniums in the stone age of development. It appears more plausible that they were already in a high state of intelligence and were not many generations removed from the time when man was created perfect. Wherever they scattered on the face of the earth, they were able to establish new kingdoms, and develop crafts and industries that spoke strongly of previous knowledge. How would a Stone Age native of New Guinea, for instance, without outside help, suddenly be capable of the engineering required to build the pyramids or the hanging gardens of Babylon, or a seaworthy galley capable of sailing the oceans?

Even in faraway China, when the Shang people settled on the rich farmlands along the Yellow River they built large cities and seemed to have a ready knowledge of how to establish their civilization. Their recorded history goes back almost to the time of Noah's death. They seem to have developed a written language of their own very early and used moveable type in printing, long before Gutenberg.

The Celts, descendants of Gomer, traveled into Western Europe and crossed the channel into Britain. They had cattle, sheep, horses, wagons, iron tools, and weapons when they settled in southern England. They raised grain and livestock, and fought intertribal wars among themselves, just as did the other nations about them.

As we have seen, it did not take long for man to scatter widely over the continents. After all, it does not take centuries for man to cross Siberia; a year or two was, even then, sufficient. The frontiersmen in America, in later years, crossed wide stretches of continent in a short space of time on foot, in spite of constant danger from enemies. So, when the earth was empty, with continents wide open to exploring bands, grass and game abundant, why should the adventurers stop short of the ends of the earth? There was certainly no shortage of bold, venturesome spirits in those days of long ago.

When the Celts crossed the channel into Britain they had cattle, horses, wagons, and the rest of the tools needed for farming.

[1] Life Nature Library. 1961. *The Desert.* P. 128.
[2] Life Editors and Lincoln Barrett. 1962. *The Epic of Man.* Golden Press, New York. Pp. 41-47.
[3] *Ibid.* P. 49.

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The Queen of Sheba could not believe the extent of Solomon's grandeur.

20

Who Were the Cave Men, Anyway?

The boys were surprised to see drawings of wild bulls and other animals on the walls of the cave.

A GROUP OF French boys were out rabbit hunting near Lascaux, in southern France in 1940, when suddenly their dog, Robot, disappeared. Coming to the place where they had last seen him or heard his bark, they found a hole in the earth left by the roots of a fallen tree. They could hear their dog down below. Tearing the hole larger with sticks and knives, the boys slid down about 25 feet and found themselves and Robot in a large room. They lit matches and were surprised to see drawings of wild bulls and other animals on the walls.

When they came out and returned home they told the townspeople about their find. Abbé Henri Breuil, a French priest who was one of the world's leading authorities on cave art, came to see it. This cave proved to be one of the greatest archeological finds in Europe, telling much of the life of the people who had lived in it many centuries before. It contained an abundance of colorful paintings of the animals of the time (horses, deer, bison, to name a few), and also of the people who had hunted them. This was by no means the only cave that had been found with drawings in it, for France alone has more than 70, but it was one of the richest finds.

The area of France where most of the caves are found has underlying strata of limestone that is cut up by the beds of rivers and streams; from this porous rock, water has leached out the caves. The fact that the drawings in the caves are in so perfect a state of preservation even though they were made in prehistoric times shows that the caves must have been formed some time before that. Any leaching that may still be taking place in them is insignificant compared to that which originally made the caves. They were probably washed out shortly after the Flood, before the lime had had

time to become very hard and turn to stone.

In addition to pictures, the explorers of these caves also found a wealth of artifacts, objects made by the early inhabitants for their own use. There were spear points, hand axes, and tools. All were made either of bone or stone. They also found little images that were carved out of bone by the early artists. In some of the caves they found buried skulls of cave bears in stone-lined cairns. Large numbers of animal bones were unearthed as the men dug in the floors of caves and around their entrances. Many skeletons of the cave dwellers have also been unearthed, studied, and compared with those found elsewhere, and with modern skeletons.

In one cave, Explorer Norbert Casteret found a large stream of water flowing out through a low, narrow passageway. He dived into the cold water and, swimming under water to clear the low roof, came out into another series of chambers. When he was able to illuminate them he saw that man had been there before.

A year later, Casteret returned with an explorer friend. They found clay models of bears, horses, and lions on the floor, in addition to pictures that had been painted and cut on the walls of the cave. It is possible that the stream was not blocking the entrance to these chambers at the time early men lived there, but it had till now effectively kept out modern men. Eventually workmen were able to divert the stream and make the rooms more easily accessible.[1]

Unfortunately, when men have opened and lighted these caves, fungus has begun to grow in them. In some instances, this has destroyed the art work that has kept so perfectly since prehistoric times.

Some of the scientists who have studied these art galleries have concluded that the pictures were not drawn for the eyes of the general public. Many are in remote passages, and often the pictures are drawn on walls and ceilings that are difficult to view. They further concluded that these pictures dealt with the magic or religious rites of the people and were part of the supplication to their gods for success in their hunting.[2]

Who were these people? Where did they come from? Were they, as we are told, the progenitors of our race? Did they slowly emerge from bestial darkness to become the present enlightened nations? The following paragraphs provide an alternate explanation for their existence.

There are always in any society members who do not fit

Cave explorers also found many spear heads, hand axes, harpoons, needles, maces, and carved images that had been used by former occupants.

In one cave explorers had to swim under water to get to another series of chambers in which they found clay models of animals, as well as pictures.

Did these people slowly emerge from bestial darkness to become today's enlightened nations?

Sometimes they multiplied in new countries and became powerful enough, as did Genghis Khan, to come back and ravage and scourge the nations they originally left.

into it, for one reason or another, and therefore drift to the fringes, living apart. They may be fugitives from tyranny, or merely from the restrictions of society. But they tend to band together, as did the men with David in the wilderness when he was fleeing from Saul. They might develop into bands of brigands that preyed on travelers. Or, possibly, they would settle in new places, become powerful nations, and compete with the ones from which they originally came. Those introduced at the beginning of the chapter were not of such a nature, however; they belong to still another group.

In any numerous society there are also the lazy, weak, feeble-minded, and the insane. Today many of these are cared for by the government in institutions. In earlier times they were driven off to fend for themselves as best they could or to starve, as were the lepers and devil-possessed in Bible times. Naturally, these unfortunates drifted into the backwaters and eddies, away from the mainstream of civilization, considered as the scum and offscouring of society.

Because of competition from the more capable, these castoffs had to be satisfied with the less desirable places of earth—the forests, mountains, river canyons, and unoccupied steppes—in which to live. For protection and better hunting they also banded together in small groups. They could fish and hunt and were able to survive and had a minimal existence in rude shelters they built of tree branches covered with earth and skins. Along the rivers they found shelter in caves. Because of the absence of weathering, the record of their existence is there most plainly read.

Some boldly pioneered and settled in new lands, as did Daniel Boone and others of our frontiersmen.

Because the power of procreation is not denied to the dim-witted, these people probably multiplied rapidly. Through inbreeding within their limited groups they would tend to become more uniformly feeble-minded, gross, and bestial in appearance. Their pattern of living was so crude and at so low a subsistence level that degenerate races could evolve.

Those of their offspring who happened to be of normal intelligence would likely not choose to stay in that environment. They would go elsewhere, as today children of exceptional intelligence and ambition leave depressed areas to find better opportunities in more progressive surroundings. This tended to leave these tribes more uniformly degraded and subnormal than ever.

These rejects from society, degenerate as they may have been, were still great hunters. They had to be to survive their

times. Like the Pygmies of Africa, they still possessed skill and cunning and could trap the woolly rhinoceros, wild horse, bison, and woolly mammoth for food. Deer seemed to be a common item of food on their menus.

Throughout the Old World fossil skulls of many different types of these men have been discovered. Some were not too different from modern man. Others, in some tropical countries, were more apelike, with protruding mouth, heavy brow ridge, and sloping forehead.

As we have intimated, these people were not all on the same level of intelligence or culture—some lived better, others worse. Most of them ate roots and picked wild fruits in season. But they depended largely on the meat and fish that they captured. In their hunting they used spears tipped with stone, and also stone axes. Fish were killed with spears or caught in basket traps. The mammoth, rhinoceros, and other large animals were caught in pits lightly covered with branches and leaves. At times they found large animals mired in swamps, and then they feasted. As they increased in number they were able to drive herds of wild horses over cliffs, as the American Indian did the bison in more recent times. At one place in France the bones of an estimated 100,000 horses have been found at the base of a cliff.[3]

Their wicker-basket traps caught fish in abundance at spawning time; they dried these fish to tide them over the lean winter months. Only the strongest survived the hard winters, by clothing themselves in the skins of animals and building shelters or retreating into the caves during the time of excessive cold. The period of the continental glaciers must have been hard on them, and no doubt many perished during that time. They built fires, either by friction or by preserving coals from fires lit by lightning or hot lava.

The usual summer habitations were near the entrances of the caves. Inner recesses or large rooms were reserved for religious rites, where they propitiated their gods, entreating them for success in hunting or to grant them fertility. The latter seemed to preoccupy them considerably. Evidently there was much fighting between tribes, and the more populous they were, the better they were able to protect themselves. Another reason why fertility would be important to them was that disease and hard winters with starvation could quickly reduce the number of the tribe.

The pictures of animals in the caves were also done, in part, to show their prowess in hunting. American Indians did

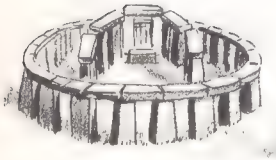
They were able to drive herds of wild horses to their death over cliffs.

They caught fish in wicker baskets, during spawning, and dried them for winter use.

The pictures they painted in their caves were apparently made to invoke the help of their gods in the hunting of these animals.

Ordinarily they treated their dead with respect. Often they sprinkled red ochre over them in burial.

They covered their dead with the large shoulder blades to keep wild animals from digging them out.



Religious worship became quite elaborate in some of the larger, more settled communities. In a number of places large cut stones were erected, as at Stonehenge, England, to serve as a temple.

the same, decorating their wigwams with stylized pictures of great events in their lives. The animals on the walls were painted with earth colors mixed with grease, and also with smoke and carbon from burning pine knots. Sometimes they scratched them on the walls with sharp rocks.

According to available evidence, some of these people were cannibals. Whether they ate human flesh as part of a mystic ritual or for food we do not know. It may be that it was done only in times of dire famine. Ordinarily they treated their dead with respect. Many were buried in the caves. The tribes that lived in the open plains also dug graves. In what is now Poland shallow graves have been found, the dead lying on their sides in a sleeping position, spears beside them, and sprinkled with red earth. These people seemed to believe in an afterlife, for they supplied their dead with what they considered necessities.[4] In a later grave a chieftain was found sealed in a funeral cave together with his slain wives, attendants, horses, and cattle. He would need them in his journey to the afterworld, they thought.

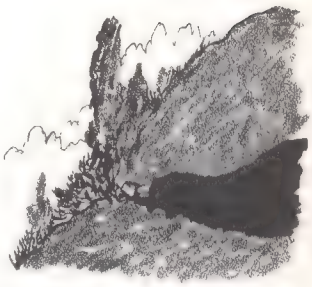
Caves are not found everywhere, and those tribes living in places not so favored had to build for themselves shelters of poles and branches, interwoven with reeds and daubed with clay, as primitive people still do in various parts of the world. Those who lived a nomadic life built more flimsy shelters of poles and skins that could be transported from place to place as the need arose. Others, more stabilized and on a higher cultural level, built more permanent dwellings, cultivated land, and kept domesticated animals. As settlements grew in size they improved in other ways toward more advanced forms of government.

In communities such as these religious worship also became more elaborate. In a number of places in Europe groups of megaliths, or large cut stones, were erected as outdoor places of worship. They usually consisted of great stones set up in rows or circles, and the amount of labor that went into making some of them is astounding. For the well-known Stonehenge, near Salisbury, England, the stones were cut out of quarries many miles distant, and laboriously transported by land and water to the temple ground. Here they were set up in such a way that the central arch frames the setting sun at the winter solstice, when viewed along an avenue between the large stones.

As time went on and population pressures increased, some of the most retarded of the tribes were exterminated by oth-

ers or driven into still more remote backwaters. The more advanced of them were conquered by the Roman Legions and became slaves. Later, when the Roman Empire disintegrated, they briefly regained their freedom, only to become serfs of the rising class of noblemen as the feudal system evolved. They then lived in villages clustered around the lord's castle and had the security of his protection and direction. Their former cave habitations knew them no more. Bushes grew over the entrances, rockfalls closed them, and their existence was not even suspected till in more recent years man's curiosity again brought them to light.

[1] Norbert Casteret. Discovering the Oldest Statues in the World. *National Geographic*. Vol. 56, No. 2 (August, 1924), pp. 123-152.
[2] Johannes Maringer. 1960. *The Gods of Prehistoric Man*. Alfred A. Knopf, New York. P. 106.
[3] Life Nature Library. 1965. *Early Man*. P. 148.
[4] Josef Augusta. 1960. *Prehistoric Man*. Paul Hamlyn, Ltd. London. Plates 18, 49, 50.



In time their cave habitations knew them no more. Rockfalls closed the entrances, and bushes hid them from prying eyes.

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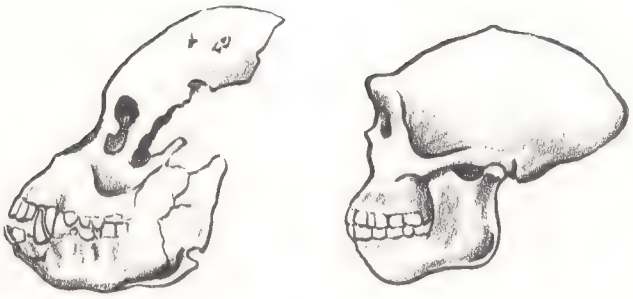


As indicated by the skulls that have been found, the level of intelligence no doubt varied greatly in these castoffs of society.

21

Man in America

AT SOME TIME in the early dawn of renewed life on earth after the Flood, man followed the migrant hordes of animals from Asia to America. Just exactly when, no one knows, but the first men must have arrived before the time of the continental glaciers.

Several nations of the time were good boat builders. Even a primitive walrus-hide boat is sufficient to carry people across many miles of ocean, as the Eskimos have proved many times.

The civilizations of China and Mongolia began about the same time as the ones around the Mediterranean. They probably were the source of the first Americans. The Mongolians, particularly, were a wide-ranging and restless people who would not be stopped by a narrow strip of water.

Many peoples of that period were excellent boat builders and would not need a land bridge in order to cross from Asia to America. The Eskimos of recent times sailed widely over the northern seas in boats made of a frame of driftwood with walrus hide stretched over it. Boats such as this could have been used by the first Americans.

Population pressure was not necessary to drive these people from their home acres. Curiosity was enough. Like settlers of the American West, they would want to see what was over the hill, in the next valley, and the next, and the next. It kept them searching and exploring.

During the seventeenth-century American expansion Oregon and California were settled long before the prairie regions. The plains were to be crossed only, not settled. The same may have been true of the steppes of Siberia. Always there was land more fertile and grass more green beyond the mountains, and so they kept coming.

During the ice age many immigrants came across the Bering Strait land bridge. They came through the bare central valleys of Alaska, on to the Mackenzie River and up its valley, through Alberta, to spread out south of the glaciers

across the United States, though none of these places were even named at the time. For a while during the period of continental ice, geologists say, there was a hundred-mile-wide corridor, just east of the Rockies, that was free of ice during the summers. This was doubtless the main migration route for both men and animals. They also came down the inland valleys of British Columbia, and some came by boats through the inland passages along the coast to settle on the inlets and along the mouths of rivers.

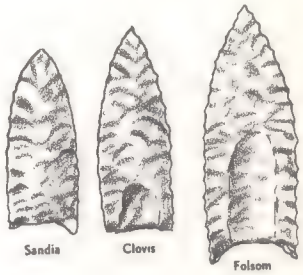
Just who the first people were and where they settled we do not know. We cannot call them back from the shadowland to which they have gone, for they left behind no written speech. All they left were a few artifacts, and the remains about campfires and villages in the form of cast-off bones of prehistoric animals they had killed for food. There are the spear points they made of flint. Those found in Sandia Cave, New Mexico, had only one shoulder point at the rear; the Clovis points had no pointed shoulders, but were fluted part way up the sides. Distinct from both of these were the Folsom points, thought to be the earliest, having two shoulder points and fluted on both sides.

These Folsom points are distinct from all others in America, and wherever they are found we can expect these tribes to have traveled. They have been found in a bay southwest of Anchorage, Alaska, and in various places from Alberta down to New Mexico. This seems to indicate the route these people took to get to their final home. Hunters with spears killed the mastodon, mammoth, short-faced bear, early camel, horse, and the giant bison, which had a horn spread of about six feet.

Most of the early Americans eventually settled down in villages, where they farmed and hunted till a stronger or more warlike tribe dispossessed them. Then the newcomers lived there till they in turn were driven off and still another tribe took their place. Pressures such as this kept the people moving on and on until some of them landed in the high mountains of Peru, where they built one of the greatest empires known in the New World at the time the white man came from Europe.

The Incas built stone cities, fortresses, highways, bridges, tunnels, and roads that amaze us. In their buildings they cut the stones so carefully and fitted and matched them so closely that they needed no mortar. While most of the early civilizations of Asia began in fertile river valleys, the Incas carved their farms out of mountain valleys, and built great irriga-

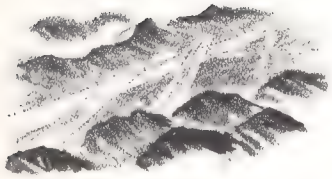
During the ice ages waves of migration came across the land bridge through Alaska, then down the two corridors in the mountains to regions farther south.



Spear points that have been found, characteristic of the various tribes, mark the route they took.

They cut the huge stones so carefully that there was no need of mortar.

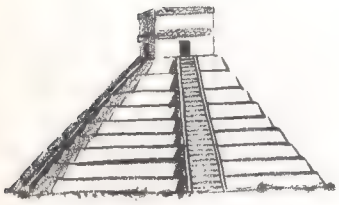
tion systems to water their fields. They domesticated the llama and the alpaca; they grew corn, potatoes, and a number of other food plants, and apparently prospered. Their system of government was well organized, and their culture was, in some respects, the highest in the world. Their skilled artisans produced treasures in precious metals that attracted the gold-obsessed Spaniard, Pizzaro, who conquered and doomed them as a free nation.



In the altiplanos of Peru have been found what pilots facetiously call "prehistoric landing fields."

In the altiplanos of Peru there are what pilots facetiously call prehistoric landing fields. From the ground they are not readily apparent, but from the air they look like runways built at different angles to each other. A study from the ground showed that they were made by removing stones from straight strips of gravel desert. The difference in color value of the strips resulted from the fact that the weathered surfaces of the rocks alongside the strips were darker than the gravel where the top rocks had been removed.

These strips were not made to prepare the ground for cultivation, for it was bare, dry gravel; nor were they drill fields. Why should they be so long, sometimes triangular, and at acute angles to each other? The solution was eventually found in the discovery that at the summer and winter solstices the sun shone along these paths as it was rising and setting between the mountain peaks. Apparently this was part of their calendar, and it probably had some connection with their worship of the sun.



The Mayas built great pyramids and temples in the jungles of Yucatan and Guatemala.

To the north of the Incas, in the jungles of Yucatan and Guatemala in Central America, the Mayas built another empire with great temples and pyramids, centuries before the time of Christ. They developed a system of pictographic writing, and a calendar that was more accurate than any other at that time.

The Aztecs built a fortress city on an island in a Mexican lake.

Still farther north in Mexico the Aztecs, a warlike and bloody people who offered as many as 20,000 human sacrifices to their gods at a single festival, were the ruling powers. The fortress city of the Aztecs, built on a lake, was large enough to house 60,000 families. It could be reached only by a long causeway. Another Spaniard, Cortez, conquered them by a combination of boldness, firearms, horses, deceit, and collusion with their enemies. This put an end to another civilization that had reached a high state of development before the white man came to the Americas.

The people of Asia did not stop coming to America after the first invasion, but kept on coming in wave after wave of

migration. As the wild tribes fanned out across the open country they formed many separate cultures in the different areas of mountain, desert, plain, and forest, and built civilizations of their own. Though they were of much the same original stock, the successive waves of immigrants had been separated by time and space and developed in diverse ways. They learned to make different types of tools and weapons, and each group spoke its own language or dialect. The Indians and Eskimos of northern Canada may be some of the most recent arrivals. Their features and complexion show their relationship with the orientals of Mongolia and Siberia. Some of them probably have come since the time of Genghis Khan. Actually the Aleuts and Russians of the Aleutian Islands have probably come most recently from Asia.

The immigrants took dogs along with them or domesticated wild ones. The Eskimos used them to haul their sleds and the Indians to pull their travois when moving their household goods.

Prairie Indians when moving, used dogs with travois to haul goods.

Horses apparently did not die out in America before the arrival of the early Americans, for horse bones have been found in prehistoric camps at Folsom, New Mexico. There seems to be little evidence that the immigrants brought horses with them from Asia or that they domesticated them in this country.

When the Spaniards brought horses to Mexico the Indians acquired this important adjunct to their life on the plains. They captured horses in battle, stole them at night, or caught ones that had gone feral in the desert. Soon they became some of the best horsemen in the world. The plains tribes north of Mexico were eager to obtain these wonderful beasts, and they traded for them, captured them in battle, and raised their own.

By the time the explorers from the Eastern States region crossed the plains they found that the Western Indians were all well mounted and counted their wealth in horses. The West was an ideal habitat for the horses, and they multiplied rapidly. As a result of the Indians' rough treatment of them they also became extremely hardy and tough.

After the Spaniards brought horses to America, the Indians soon became expert riders.

The plains Indians did not build stables or provide hay for their horses in winter. They simply let them paw in the snow for grass or chew cottonwood branches along the creeks. Only the toughest ones survived, and they became exceptionally thrifty, though small and tick-ridden. In the northern coniferous forest, where the winters were long and

Eskimos are well adjusted to their frigid country and live happy lives.

severe, the horse could not survive. The dog was used—here, and on the tundra, because he could live on frozen fish and caribou meat.

Northern people such as the Eskimos, Laplanders, and Yakuts have become singularly well adapted to their frigid country and are an exceptionally happy people even though they live in a seemingly hostile environment. Unable to farm, they still have a culture that satisfies their needs. In a land of snow and ice they built shelters out of snow, and in a land of little wood they heated these shelters with the oil of the seal they caught in the sea. They hunted the caribou and bear, or followed the reindeer herds. They fished through the ice in winter. Their clothes were made of the skins of caribou, reindeer, seal, and wolverine, and they managed to remain comfortable even though the thermometer often dropped to more than 60 degrees below zero.

On its way to India part of the fleet of Alexander the Great was blown far off its course by a storm and lost.

The civilization of some of them was equivalent to that of the alleged stone-age savage, but from the bones, tusks, sinews, and skins of their game they made all their tools, weapons, sleds, harness, and clothes. The Lapps and Yakuts have avoided dependence upon the vagaries of the seasonal migration of the caribou by domesticating the reindeer, thus keeping their supply of meat and fur with them. Their life involves migrating with their herds from their winter quarters to their summer calving grounds, but to them it is worth the trouble.

The settling of the South Sea Islands has been somewhat of a mystery because some of the islanders seem to have characteristics differing from their neighbors on either side of them. This has been partly explained by the influx of people from far away. A large part of Alexander the Great's fleet, when he set out to conquer India, was blown far out of its course and wrecked on the islands. The sailors and soldiers had no way of returning, so they stayed and married the natives who had originally come from farther north. This infusion of Western blood accounted for part of the racial mixture.

Thor Heyerdahl, on Kon-Tiki, proved that people could travel on a balsa raft from South America to the South Sea Islands and live on the abundant fish in the Humbolt Current.

Then, as Thor Heyerdahl showed by his journey on the Kon-Tiki, Indians from the coasts of South America could have sailed westward on balsa rafts, as he did, landed on the South Sea Islands, and settled there. Sails would speed their journey, and they could live on the abundant fish in the Humbolt current along the way. We wonder how they could find the tiny specks of islands in the vast Pacific, but islanders have

little trouble today. They sail toward the piled-up white clouds that rise above the islands with updrafts from the heated land areas. These cloud piles mark the islands and atolls like stakes, visible for long distances across the ocean.

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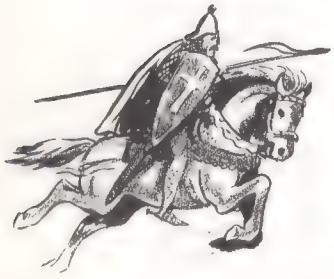
Island navigators find the small specks of islands in the vast ocean by the piled-up clouds that rise above the heated land and mark them like stakes.

22
Kings and Serfs and Recent Men

A stone wall was built by Hadrian to keep the Picts and Scots from raiding the more civilized portions of Britain.

WHEN KING LOUIS the Pious, of France, heard that his father, the Emperor Charlemagne, had died in the year 814, he hurried to go from Doué, in Aquitaine, to Aachen to take the reigns of government. It took him just 30 days to travel the 380 miles. Imagine what the country and the means of travel must have been like at that time! Even though the land had been settled for centuries, and villages stood along the king's route, the frontier wilderness was seldom more than a few feet from the makeshift road he traveled.[1]

In many ways France was more civilized when it was under the Romans than it was at this time centuries later. England too under the Romans was quite civilized as far as Hadrian's Wall. Beyond that were only wild heather and Picts and Scots. When Rome's internal power weakened and her legions left, most of the countries she had occupied reverted to their previous state. Roads fell into disrepair, and the people huddled in primitive villages around the stone castles of warring nobles.



The knights rode about, in the days of chivalry, looking for trouble. They were as unreasonable as insecure children, ready to flare at the slightest threat.

In England, during the reign of Alfred the Great and later kings, the Saxons lived in this manner much of the time and were in constant fear of the raiding Danes. Their existence was on a very primitive level. The Arthurian legends from an earlier time speak of the chivalry of fine lords and ladies who lived in magnificent castles. A more analytical study indicates that the castles were crude stone piles with very little comfort, not to mention magnificence, about them. The boasted finery of knighthood was a very thin veneer and needed the magic of legends to support the ego. The knights rode about in their tin armor searching for adventure, ready to fight at the drop of a word. Many of them had the unreasonableness of insecure children whose fits of temper remind

one of a bull moose in the wilderness during the rutting season, flaring at the slightest challenge.

During the time of the Normans the situation had improved very little. Their forbidding castles were built primarily for defense, and in many cases did not even provide for the comfort of a fire to warm them in winter. We wonder how they survived! Their tables were planks that rested on trestles in the large hall. These were cleared aside when they were not eating.

In the reign of Richard the Third his corpulent mother traveled in a wheeled vehicle to the south of England. On her return trip, she became hopelessly mired in the road and had to be extricated by the men who followed Wat the Tyler in his ill-fated rebellion of the serfs against the nobles.[2]

Christianity spread through most of Europe, largely on the heels of the conquests of Charlemagne, who vigorously Christianized nations with the sword and converted them by edict. There were also itinerant clerics who went far beyond his Holy Roman Empire and carried the Catholic faith with them. In England, during the time of Alfred the Great, the whole Danish section instantly became Christian as the result of the Treaty of Wedmore.[3]

Of course this Christianity was of a superficial nature, consisting largely of rituals and forms. Bishops of the church built many cathedrals and abbeys at this time with tithes and fees collected from the merchants and the poor. They acquired wealth also from the huge land grants they received as favors and bribes from kings. These bishops became a powerful political influence in their countries because they represented the international power of the pope of Rome.

The lot of most of the peasants and serfs was, however, not greatly improved from that of their cave-dwelling ancestors. They were not even allowed to hunt game for a living, since that was the privilege only of the lord. The upper classes, even though they made great pretense of piety, had no thought of improving the lot of the poor serfs. The Magna Charta, which the nobles forced King John to sign, was drawn up only to protect their own rights against the king; it did nothing for the common man. This "stolid brother to the ox" must be kept in his place. Education would only serve to make him discontented and rebellious, so it was not for him.

When the Bible was translated and made available in the serf's vernacular he began to see beyond the drab, everyday

Picturesque as the medieval castles were, they were actually just crude stone piles, often without even provision for heating in winter.

Many cathedrals and abbeys were built as the Church grew wealthy.

The lot of the serf was not improved by this form of Christianity. To the clergy, as well as to the nobles, it was important to keep this "stolid brother to the ox" in his place.

It was not till the Bible had been translated into the vernacular of the common man that he began to see beyond the drab, everyday life possibilities of a better future.

life to improved prospects for the future. Increased travel during the Crusades and the exploration that followed enabled man to see still wider horizons. As the Reformation spread through various countries, the freedom of the mind that came with it brought a whole train of new ideas and inventions. People pioneered in new worlds, founded new nations, and evolved principles of equality, freedom of thought, and individual initiative.

However, in the new lands that were being discovered all over the world, explorers found races of men still living in a most primitive, Stone Age existence. In many instances they were on a level with the Neanderthals of Europe and elsewhere.

The Bushmen of the Kalahari Desert, in Africa, were a good example. They were a pygmy race, which maintained an existence in a dry land by hunting the antelope, springhaas, and game birds. They ate wild gourds, and sucked ostrich eggs, the shells of which they kept to use for storing water.

The existence of the Bushmen of the Kalahari is on a level with that of the prehistoric cavemen.

These little people lived in small brush shelters and owned nothing that they could not carry with them. For hunting they used stone-tipped spears, bows and arrows, and stone axes and knives. Sticks and flat stones were used for digging. Cooking utensils were almost nonexistent, but some earthen pots were used for storage at the time these Bushmen were first discovered.

There were at the same time other African tribes living near them that were considerably more advanced in their culture and intellectual level than the Bushmen. As a matter of fact, they exacted tribute from them. This indicates that at the time of the Neanderthal and Cro-Magnon men there could have been more civilized people living near them who may even have subjugated them or kept them as serfs. It is not necessary that they all be considered as successive civilizations, each taking millions of years to evolve.

The Ituri pygmies were cunning hunters, able even to spear and kill the forest elephant.

In the Ituri Forest of Central Africa there lives another pygmy race on much the same intellectual level as the Bushmen. Their dwellings are small leaf-covered wigwams. They live a very simple life, come to terms with their environment, and are well adjusted to it. In spite of their apparently low mental level they are cunning hunters, able even to spear and kill the forest elephants without first trapping them in camouflaged pits.

The people of the Australasian region varied greatly in

cultural attainments when they were first discovered. The aborigines of Australia were possibly even lower on the ladder than the Bushmen. In many cases they lived right out in the open without shelters of any kind. They too lived off the land, were crafty hunters, and even now are regarded as some of the best trackers in the world.

On the other hand, the aborigines of New Zealand possessed quite a high type of intelligence, according to our way of measuring. Their government and religious rites also suggested a high cultural level. Similar differences could also be seen in the aborigines of New Britain when contrasted with those of Fiji or Samoa. New Guinea still has a Stone Age people living in small tribes that are often at war with one another and in some cases cannibalistic. Many of these tribes are entirely ignorant of the world about them and vice versa.

When Darwin, on the historic voyage of the *Beagle,* rounded the tip of South America he stopped at the islands of Tierra del Fuega where he saw aborigines stand around barefoot and half naked in the snow and sleet. He wondered how they could withstand the low temperatures. Even today the few that are left will play in the snow and lie down naked in it. Studies in recent years have shown that the metabolism and heating system of their bodies have made an adjustment to the climate, and compensate for the fact that they wear so little clothing.[4] Apparently man, as well as plants and animals, is able to adjust to extreme climatic conditions.

Significantly, individuals from some of the most primitive of the peoples mentioned above are capable of rising quickly above the level of their tribes. When they accept Christianity and go to school they can, in a few years, bridge the gap of alleged millenniums and become civilized people able to take their place among others in today's world. It is not so much a case of a primitive mind that requires ages to develop into a modern type, but rather a degenerate mind, clouded by generations of sin and depravity, that has become enlightened and has regained some of the capabilities with which it was once endowed.

Paleontologists attempt to demonstrate with their series of skulls the successive stages of development that took place from the apelike types of Java and Olduvi Gorge, to the caveman types, and then on to modern man of today. This process, that allegedly took millions of years, presupposes that the early ancestors of man have been extinct for ages and that the only remnants of them are the fragments of skulls and

A series of skulls is arranged by paleontologists to show the successive development of man from apelike ancestors to the present. Is it not also possible that many of these were living contemporaneously, as many different types do today?

skeletons that have been found here and there.

On the other hand, if these races of men were merely degenerate they could easily be living contemporaneously, some of them today. We have called attention to the Bushmen, pygmies, Australian and New Guinea aborigines, and others, but there is increasing evidence that there may be remnants of peoples living today in wilderness areas who are still farther down the cultural and intellectual ladder. There seems to be more and more evidence of the existence of some subhumans living in various areas of the world, including America's Western mountains. If these reports can be substantiated by science they would add another dimension to the picture.

And so this strange world of ours spins on its axis with all its complexities and secrets to intrigue the mind of man. We think we have nearly all the answers and that within a few more years we will know it all. However, as the years go by, new mysteries arise, and for every question answered several more call for attention. Man is clever enough to leave the confines of this globe and visit a neighboring sphere, but always there are new worlds to discover and explore, and the end of learning and mental development is nowhere in sight.

[1] Lewis J. Halle. 1963. *Spring in Washington.* Atheneum Press, New York. P. 65.
[2] Thomas B. Costain. 1964. *The Last of the Plantagenets.* Popular Library, New York. P. 53.
[3] H. G. Wells. 1956. *The Outline of History.* Vol. 2. Garden City Books, New York. P. 516.
[4] Life Nature Library. 1962. *Evolution.* Pp. 32, 37.

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23

All Things New

WHEN THE EARTH shall "wax old as a garment" and God in His good time sees fit to make all things new, the righteous will spend a thousand years with Christ in the Holy City somewhere in outer space beyond the gates of Orion. We are told that the surface of this earth of ours will be destroyed by fire. The heavens will pass away with a great noise, the elements will melt, and the surface of the earth will be consumed.[1] This could possibly come about through massive volcanic activity from the molten interior of the earth. It could also occur through a giant atomic blast that by chain reactions would scorch the crust of the earth to a cinder. Or, as some have suggested, a large comet might come too close and disrupt the earth's equilibrium.

We think of all the water on the earth, the swamps, lush, green vegetation, and the ice of the polar caps, and wonder how it could burn. However, man's experience with atomic fission has shown that anything can burn instantly and be consumed, leaving only molten slag. Water is, after all, composed of two elements, oxygen and hydrogen: the latter burns easily and the former is necessary to all combustion. God has power and knowledge far beyond that of man, and He has many ways of accomplishing this cleansing of the earth of which we know nothing.

It appears that several different types of action will combine to destroy the surface of the earth. Volcanoes will pour out ash, rocks, and lava. Lightning will flash from the sky and combine with the fire on the earth. The ground will be convulsed with earthquakes.[2] The waters of the oceans will boil and rage. Mountain chains will disappear. In the shriek of the hurricane and the roar of the tempest, islands will sink into the sea.[3] This reshaping of the earth's crust can well be

as great as it was at the time of the Flood. It may even undo some things that were done then.

While the redeemed are in heaven, the weathering, eroding, and disintegrating process will continue here on earth. From a desolate cinder block it will gradually change as does our landscape after a volcanic explosion or a fire. But there will be a big difference. Today life comes crowding in from all around to re-establish itself in the bleak and barren-looking soil after a fire, but on the burned-out earth at that time there will be no plant or animal life to make a comeback.

There will be neither bird nor man.[4] It is doubtful that the ocean water will hold even microscopic life of any kind. Perhaps at this time all disease germs will be destroyed or altered, for there will be no sickness or death in the New World. Possibly even beneficial bacteria will be destroyed or reoriented.

Weather may still exist on the earth. Wind, rain, frost, and sun will still break down the rock, cinders, and ash in preparation for it to be the soil of the new earth. Satan, as he walks to and fro on the bare earth, will see no living thing. He is the father of death and will see only the fruits of his work.

After the millennium the New Jerusalem will come down to the earth with the redeemed host in it. The Mount of Olives, we are told, will spread out like a plain to receive it, and the city will rest in all its splendor. After the resurrection and destruction of the wicked, including Satan, in the second death, fire will come down from heaven a second time to complete the work of purifying the earth. Then the real restoration of the earth can take place.[5]

It may be that life will start again from around the Holy City as it perhaps did from the Garden of Eden, spreading out in ever-widening circles to encompass the whole earth. It may also be that God will choose to replenish the earth all over at once. The rugged mountains will now have been melted down by the fire from the Lord into rounded hills. The ash forms the basis of new soil, and as grass springs up at the bidding of the Creator the hills and plains are covered with verdure. Trees, fully formed, stand in groves, as at the beginning, and animal life is also restored. The original kinds of animals, birds, and all other creatures that God created in Eden, will again be there to wander through the fields and woods.

Mankind, the remnant saved inside the city, will again

populate the earth as sinless beings. At the resurrection all arose with the same stature they had when they went into the grave. But in the Holy City during the millennium they have eaten of the tree of life. Isn't it possible that the redeemed will have grown to the full stature of the first created man, Adam? All are given perfection with eternal life. Blemishes, ailments, and bodily deficiencies are all gone, and man rejoices in his strength as he goes out to enjoy the new creation.

It may be that the axis of the earth will be shifted back to its original perpendicular during the great upheaval that accompanies Christ's second coming. The benign climate of Eden will be restored. The oceans will likely return to their pre-Flood channels, if such was the case, and help to temper the climate of the earth.

From the Holy City the people spread out over the whole dominion that is now wide open to them. They build houses and know that they will be able to live in them through eternity. They plant gardens and vineyards and know that they will be able to eat the fruit, and enjoy the work of their hands.

Man will have dominion over the beasts of the field, but his rule will be gentle. The animals will not hurt nor destroy, and man will have no reason to harm them. He will "be in league with the stones of the field: and the beasts of the field shall be at peace" with him.[6] He will not have to struggle to rid his fields of stones. He will not work against the created world, wresting a living from hostile ground, but rather he will cooperate with it to produce an abundant life.

All the animals will be tame. The lion will not feed on the farmer's cattle, or the wolf on the lambs of his flock. The birds will not eat insects, nor the anteater—if there is one—eat ants. All will live on the fruits of the soil, and there will be enough for all. No one will rob another.

We have come to the end of the story of our Father's world, though really there is no end, for it will go on throughout all eternity. Through the various areas we have discussed in this book we have probably raised more questions than we have answered. How dull life would be if we knew all the answers! There is so much that we have not been told about Creation and the early history of our world, and there is a lot that we may never learn. There are things that disturb us, things on which we will have to withhold our judgment till answers come. Many answers we will not know this side of the grave.

On the new earth we will see it as it was in the beginning

and will understand better. There we can study through all eternity, ask questions of the angels, and focus upon the problems with minds that are unclouded by false teachings and unfettered by the limitations of degenerate flesh. Now we see darkly; then, face to face. With new facts before us we will see clearly things that have long been a puzzle to us. Our minds will be able to roam in many fields of thought and always find new and interesting vistas far beyond what we can imagine here.

In the earth made new we will understand the inscrutable purposes of God in creating this world only to have it ruined by sin, destroyed by flood and fire, and then renewed again. From this grand object lesson, watched by inhabitants of unfallen worlds, all will understand the end result of sin and rebellion against God, and all will know why sin will not rise again to corrupt our Father's world.

[1] 2 Peter 3:12.
[2] Ellen G. White. 1888. *The Great Controversy.* Pp. 636, 637.
[3] ———. 1882. *Early Writings.* Pp. 285, 286.
[4] Jer. 4:25.
[5] White. 1882. *Early Writings.* Pp. 51, 52.
[6] Job 5:23.

For Further Reading

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The perfect world as it came from the hands of its Creator, clothed with Edenic beauty, its equatorial regions wrapped in a veil of mists.

At the entrance of sin the atmosphere became chilly, but outwardly the planet showed little change. It was still watered by the evening mist and the great rivers that came out of Eden.

During the Flood the rains came down and the fountains of the deep broke open. The whole earth was covered with water, and all life was destroyed except that in the ark and in the sea.

After the Flood many volcanoes erupted, mountain chains arose, continents appeared and shifted on earth's crust, leaving large oceans between.

Because of the volcanic dust in the air the climate of the earth cooled to the extent that great continental glaciers formed in the northern regions.

During all this time great winds blew, and floods eroded the tortured earth, changing the face of the ground and shaping the contours of the hills to the form they have today.

Man, coming from the region of Ararat, spread widely over the surface of the globe. Animal life also in changing patterns invaded every habitable land.

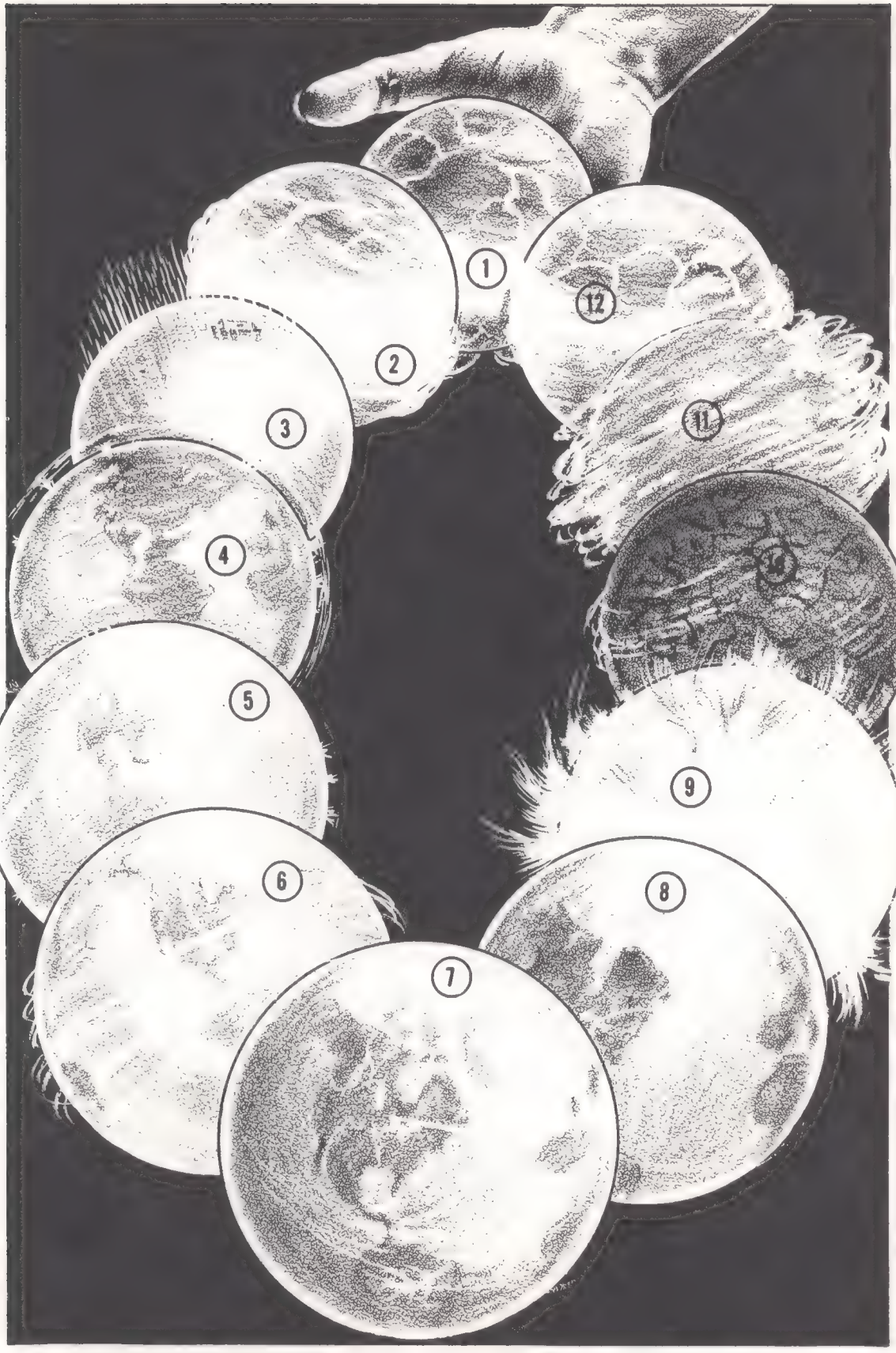
Our present world with its fluctuating climate, cold polar regions, and dry deserts is growing old like a garment, ready soon to be renewed.

In the next stage the world and all animal life on it is to be destroyed by fire. All plant and animal life will be turned to ashes.

During the thousand years when the righteous are in heaven, our world as an empty sphere will whirl in space, marking time.

"I beheld the earth, and, lo, it was without form, and void; and the heavens, and they had no light" (Jer. 4:23).

The new earth is to be recreated upon the ashes of the old—transformed like the Garden of Eden! The Holy City will come down upon it.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ABOUT THIS BOOK

How did all the animals get into the ark? Where did thorns come from? Are all fossils from creatures and plants that were buried during the Flood? Why were some of the woolly mammoths so well preserved? What is the origin of coal, oil, and gas? Who were the cave men and what happened to them? Is it possible that animals could get to America from Mount Ararat? Was there really an ice age?

In simple language this book suggests answers to these and countless other questions you may have wondered about. Nearly 400 illustrations add interest and explain the text.

ABOUT HARRY BAERG

Harry Baerg's world is the world of wildlife. He reads about it, studies it firsthand, camps amidst it, and—fortunately, for the rest of us—he draws it, paints it, and writes about it. A professional illustrator for the Review and Herald Publishing Association, he has illustrated more than fifty books in addition to his own. Books that he has authored include *How to Know the Western Trees*, *Gray Ghosts*, *Chipmunk Willie*, and many others.

Born in Saskatchewan, Canada, he graduated from Walla Walla College in 1947. He took American citizenship in 1965. The Baergs have three children.